



**AGRICULTURAL KNOWLEDGE AND INFORMATION  
SYSTEMS (AKISs) AMONG SMALL-SCALE FARMERS  
IN KIRINYAGA DISTRICT, KENYA**

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# **AGRICULTURAL KNOWLEDGE AND INFORMATION SYSTEMS (AKISs) AMONG SMALL-SCALE FARMERS IN KIRINYAGA DISTRICT, KENYA**

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March 2011

# DECLARATION

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## ABSTRACT

There has been growing interest, locally, nationally, and internationally in agricultural knowledge and information systems (AKISs) stemming from their important role in facilitating learning, innovation and the sharing and exchange of knowledge and information. Despite the fact that small-scale farmers and farmers' groups are among the key actors in an AKIS, little attention is devoted to their needs. This study aimed to understand the AKISs of small-scale farmers (male, female and the youth) in Kirinyaga district, Kenya. The study investigated small-scale farmers, and in particular farmers' groups as key actors in supporting agricultural development and linkages between actors, their information behaviour, sources of information and knowledge, linkages and flows of knowledge and information including the role of information and communication technologies (ICTs). The study also investigated the usage of these resources, barriers to accessing knowledge and information, and existing knowledge and information management practices.

The study adopted multiple paradigms and perspectives but was mainly guided by the Social constructivist paradigm and the Soft systems perspective. The theoretical framework was constructed upon an integration of the Sense-making<sup>1</sup> theory, Social cognitive theory, Social capital concept, Communities of practice (CoPs), Wilson's general model of information seeking behaviour, Meyer's information transfer model, Knowledge management theory and the Cynefin framework. The research design was a multiple methods approach that triangulated qualitative, quantitative Sense-Making, Participatory and Soft systems methodologies. Data was collected through interviews with individual farmers belonging or not belonging to a group; key informants; research, training and education institutions; civil society organisations (CSOs); and government departments using semi-structured interview guides unique to each category of informant. Focus group discussions were conducted with farmers' groups while questionnaires were sent to information providers. Rapid Appraisal of Agricultural Knowledge Systems, participatory rural appraisal methods, unobtrusive observation of the activities of farmers and other actors in the community and secondary information sources were also used to collect data.

The findings of the study showed that rich and deep data was collected through the multiple methods research design, and that no conflict arose from using multiple paradigms in a single multifaceted and multidisciplinary study where specific research questions were addressed. The Sense-Making methodology provided useful approaches to studying the information behaviour and decision making processes of small-scale farmers, and to investigate the feelings, emotions and dreams of farmers in Kirinyaga district. However, the experience of this study showed that using a multiple methods research design could result in a very large study.

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<sup>1</sup> Sense-making (lower case) is used for the theory while Sense-Making (capital) is used for the methodology



The findings show that small-scale farmers need information from diverse sources and on a wide range of topics along the production and marketing value chains, based on their enterprise(s), geographic location and the actors active on the ground. Male and female farmers expressed needs on similar topics but the needs were gender differentiated with variations in the priorities, types of information needed, the weight attached to each topic, and the information seeking behaviour. Most farmers and almost half the groups combined external information and local knowledge in their farming, and information and knowledge was shared orally along social and cultural lines. Most of the groups were legally constituted and had the status of farmers' groups; a few were cooperatives. Farmers' groups emerged as key actors in the AKIS of the district and provided platforms for learning, innovation, sharing and the exchange of ideas, information and knowledge among their members. The findings show that most groups did not share information with non-group members, which led to information asymmetries between farmers belonging or not belonging to a group.

The findings of the study show variations in sources used by male only, female only, youth only and mixed groups. Male only groups relied mostly on private sector sources, while female only, youth only and mixed groups depended more on public extension services. The main sources of market information were local markets, followed by neighbours, other farmers and cooperatives and societies. Extension emerged as the most important source of advice, information and knowledge on farming in general, followed by the private sector and neighbours. Groups mainly obtained information on news, new technologies or farming methods from extension, media and private sector actors, while they obtained most answers to their farming questions from their groups, extension services, neighbours and other farmers. There were variations in the sources used by different types of groups for advice, information or knowledge in general, as well as in sources used by farmers belonging or not belonging to a group in different geographic divisions.

There were more than 150 actors in the public, private and CSO sectors, and there were many AKISs in Kirinyaga district, which were location specific and depended on the enterprise(s) produced and the actors that were present on the ground. Most linkages were horizontal and were weak. Farmers' groups and social networks provided a unique linkage mechanism to other actors and access to services such as extension, markets and basic needs. This finding suggests the need to strengthen the capacity of farmers' groups and encourage farmers to join or form groups. There were variations in the importance, strength and quality of the relationships between actors in different divisions, locations and sub-locations, but the linkages with farmers were generally weak. The Kirinyaga stakeholders' forum and a few partnerships of actors facilitated vertical flow of information between actors but the linkages were equally weak. Farmers mainly used oral communication to access and share information and knowledge. While farmers belonging to a group generally used meetings,

neighbours and radio, farmers not belonging to a group mostly used radio, neighbours and cellular phones. The findings indicate that farmers preferred to use radio, television and cellular phones for accessing agricultural information but the usage of modern ICTs was low and most of the users were male.

Farmers encountered many barriers in accessing and sharing agricultural information and knowledge including insufficient sources in the community; lack of awareness of who the “knowers” in the community were; limited availability of information providers; poor access to and quality of information on production, value addition and markets and prices; high cost of information services; inadequate information resources and few learning opportunities; personal, social and cultural barriers; communication barriers; and illiteracy. To address these barriers and constraints, farmers used diverse sources of external information and local knowledge for decision making, problem solving, innovation and for improving understanding. While most farmers obtained operational, technical and awareness information from major sources, there was little usage of ICT based information systems. There was no bibliographic control of agricultural information resources and there were very few resource centres in the community. Most local knowledge was tacit and was held in people’s heads and therefore shared orally from elders to the younger generations and through CoPs in the groups.

The study concludes that the AKISs in Kirinyaga district were complex, dynamic, and location specific, and although there were diverse and complementary actors, the information and knowledge within the AKIS was not sufficient to meet the needs of small-scale farmers. Public extension services emerged as the key source of information for small-scale farmers and private extension services such as those offered by horticultural exporting companies were a pillar of support for commercial farmers. There were insufficient numbers of information providers, which meant extension officers were not easily accessible. These findings suggest the need to formalise and strengthen linkages between actors, to improve access to agricultural knowledge and information, and to formulate policy and regulatory frameworks that are gender responsive. There is a need for policies that facilitate the collection, processing, storage and dissemination of external agricultural information and the capturing, documenting and sharing of local knowledge.

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**I dedicate this thesis to my husband – S. J. Muchina Munyua.**

Hilda M. Munyua

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## **ACRONYMS AND ABBREVIATIONS**

AAR	After Action Review
ABLH	Association for Better Land Husbandry
ACDI/VOCA	Agricultural Cooperative Development International and Volunteers in Overseas Cooperative Assistance
ACP	Africa, Caribbean and the Pacific
AFC	Agricultural Finance Corporation
AfriAfya	African Network for Health Knowledge Management and Communication
AGOA	African Growth and Opportunity Act
AHI	African Highlands Initiative
AHITI	Animal Health and Industry Training Institute
AICM	Agricultural Information and Communication Management
AIRC	Agricultural Information and Resource Centre
AIS	Agricultural Information System
AKIS	Agricultural Knowledge and Information System
AKS	Agricultural Knowledge Systems
ALIN-EA	Arid Lands Information Network – East Africa
ALM	Actor Linkage Matrix
AMARC	World Association of Community Broadcasters
ASAL	Arid and Semi Arid Lands
ASARECA	Association for Strengthening African Agricultural Research in Eastern and Central Africa
ASK	Anomalous State-of-Knowledge
ASPS	Agricultural Sector Programme Support
ATIRI	Agricultural Technology and Information Response Initiative
AU	African Union
BROSDI	Busoga Rural Open Source and Development Initiative
CBO	Community Based Organisation
CCS	Christian Community Services
CCSP	Community Capacity Support Programme
CDF	Constituency Development Fund
CEDAW	Convention on the Elimination of all forms of Discrimination Against Women
CEEDCO	Community Empowerment and Enterprise Development through Cooperatives
CELAC	Collecting and Exchange of Local Agricultural Content
CIA	Central Intelligence Agency of the United States
CIG	Common Interest Group
CIKAP	Centre for Indigenous Knowledge Systems and By-products
CKDAP	Central Kenya Dry Areas Project
CoDF	Coffee Development Fund
COMESA	Common Market for East and Southern Africa
CoP	Communities of Practice
CRF	Coffee Research Foundation
CRS	Catholic Relief Services
CSO	Civil Society Organisation
CTA	Technical Centre for Agricultural and Rural Cooperation
Danida	Danish International Development Assistance
DAO	District Agricultural Officer
DC	District Commissioner
DCFRN	Developing Countries Farm Radio Network
DFRD	District Focus for Rural Development
DGAK	Dairy Goat Association of Kenya
DLO	District Livestock Officer
EAC	East African Community
EASSy	East African Submarine Cable System



EC	European Commission
EFG	Evergreen Farming Group
ERS	Economic Recovery Strategy
EU	European Union
EWS	Early Warning System
FADC	Focal Area Development Committee
FAO	Food and Agriculture Organisation of the United Nations
FarmNet	Farmer Information Network
FEO	Field Extension Officer
FIDA	Federation of Women Lawyers
FFS	Farmer Field Schools
FM	Frequency Modulated
FPEAK	Fresh Produce Exporters Association of Kenya
GB	Great Britain
GCARD	Global Conference on Agricultural Research for Development
GDP	Gross Domestic Product
GTF	Gender Task Force
GTZ	Deutsche Gesellschaft für Technische Zusammenarbeit GmbH
GVA	Gross Value Added
HBGMA	Highridge Banana Growers and Marketing Association
HCDA	Horticultural Crops Development Authority
HHI	Healing Hands International
HVA	High Value Agriculture
ICC	Indicative Crop Classification (United Nations)
ICIPE	International Centre for Insect Physiology and Ecology
ICRAF	World Agroforestry Centre (formerly the International Centre for Research in Agroforestry)
ICSU	International Council for Science
ICTs	Information and Communication Technologies
IDRC	International Development Research Centre
IFAD	International Fund for Agricultural Development
IGAD	Inter-Governmental Authority on Development
IIN	Indigenous Information Network
IIRR	International Institute for Rural Reconstruction
ILEIA	Information on Low-External-Input and Sustainable Agriculture
ILRI	International Livestock Research Institute
INTERPAKS	International Programme for Agricultural Knowledge Systems
IPM	Integrated Pest Management
IPR	Intellectual Property Rights
ISNAR	International Service for National Agricultural Research
ITU	International Telecommunication Union
JKUAT	Jomo Kenyatta University of Agriculture and Technology
KACE	Kenya Agricultural Commodity Exchange
KAPP	Kenya Agriculture Productivity Project
KARI	Kenya Agricultural Research Institute
KATC	Kamwet Agricultural Training Centre
KBC	Kenya Broadcasting Corporation
KBS	Kenya Bureau of Standards
KCC	Kenya Cooperative Creameries
KDFU	Kirinyaga District Farmers Union
KEMFRI	Kenya Marine and Fisheries Research Institute
KENDAT	Kenya Network for Dissemination of Agricultural Technologies
KENFAP	Kenya National Federation of Agricultural Producers
KENRIK	Kenya Resource Centre for Indigenous Knowledge
KESSFA	Kenya Small-scale Farmers Association
KETRI	Kenya Trypanosomiasis Research Institute

KFA	Kenya Farmers Association
KHDP	Kenya Horticulture Development Programme
KHE	Kenya Horticultural Exporters
KIFCO	Kibirigwi Irrigation Farmers Cooperative
KIOF	Kenya Institute of Organic Farming
KIS	Knowledge and Information System
KIT	Royal Tropical Institute
KNBA	Kenya National Bee Keepers Association
KNBS	Kenya National Bureau of Statistics
KNFC	Kenya National Federation of Cooperatives
KNFU	Kenya National Farmers Union
KPCU	Kenya Planters Cooperative Union
KRDS	Kenya Rural Development Strategy
KTDA	Kenya Tea Development Authority
KTN	Kenya Television Network
KUSSTO	Kenya Union of Small Scale Tea Owners
KWFT	Kenya Women Finance Trust
LEC	Lutte Etagée Ciblée
LEISA	Low-External-Input and Sustainable Agriculture
LFS	Local Food Systems
LiNKS	Local Indigenous Knowledge System
LLL	Linking Local Learners
LPP	Legitimate Peripheral Participation
MASA	Media Use As Social Action
MASL	Metres Above Sea Level
MDGs	Millennium Development Goals
MIAD	Mwea Irrigation Agriculture Development Centre
MIS	Management Information System
MISTOWA	Market Information System and Trader Organisations in West Africa
MoU	Memorandum of Understanding
MRGM	Mwea Rice Growers and Millers
MVIWAMO	<i>Mtandao wa Vikundi vya Wakulima wa Wilaya ya Monduli</i>
MVIWATA	<i>Mtandao wa Vikundi Vya Wakulima Tanzania</i>
NAADS	National Agricultural Advisory Services Programme
NAAIAP	National Accelerated Agricultural Inputs Access Programme
NAEP	National Agricultural Extension Policy
NAFIS	National Farmers Information Service
NAL	National Agricultural Laboratories
NALEP	National Agricultural and Livestock Extension Programme
NARC	National Rainbow Coalition
NASEP	National Agricultural Sector Extension Policy
NBKA	National Bee Keepers Association
NCPB	National Cereals and Produce Board
NESC	National Economic and Social Council of Kenya
NGO	Non-governmental Organisation
NIB	National Irrigation Board
NPEP	National Poverty Eradication Plan
NRM	Natural Resources Management
OAIC	Organisation of African Institute of Churches
OECD	Organisation for Economic Co-operation and Development
PAR	Participatory Action Research
PDA	Personal Digital Assistant
PELUM	Participatory Ecological Land-Use Management
PFI	Promoting Farmer Innovation
PFI-FFS	Promoting Farmer Innovation-Farmer Field School
PIWA	Panos Institute of West Africa

PRA	Participatory Rural Appraisal
PROLINNOVA	Promoting Local Innovation
PRSP	Poverty Reduction Strategy Paper
PTD	Participatory Technology Development
RAAKS	Relaxed (or Rapid) Appraisal of Agricultural Knowledge Systems
RAIN	Regional Agricultural Information Network
RD	Rural Development
RICTB	Regional Information and Communication Technology Broadband Network
RoK	Republic of Kenya
ROSCAS	Rotating Savings and Credit Organisations
RRA	Rapid Rural Appraisal
RUFORUM	Regional Universities Forum for Capacity Building in Agriculture
SACRED	Sustainable Agriculture Centre for Research and Development
SAP	Structural Adjustment Programme
Sida	Swedish International Development Agency
SRA	Strategy for Revitalisation of Agriculture
SWOT	Strengths, Weaknesses, Opportunities and Threats
TV	Television
T&V	Training and Visit
TCB	Tissue Culture Banana
TEAMS	The East African Marine Systems
TIST	The International Small Group and Tree Planting Program
ToT	Training of Trainers
TRI	Tea Research Institute
TRF	Tea Research Foundation
UKZN	University of KwaZulu-Natal
UN	United Nations
UNDP	United Nations Development Programme
UNECA	United Nations Economic Commission for Africa
UNESCO	United Nations Educational, Scientific and Cultural Organization
USA	United States of America
USAID	United States Agency for International Development
VERCON	Virtual-Research Communication Network
WDF	Women Development Fund
WSSD	World Summit for Social Development
WTO	World Trade Organisation
WUA	Water Users Association
YDF	Youth Development Fund

**Currency conversion:** (Date of exchange rate = August 2008)

1 US dollar (USD) = 75 Kenya Shillings (KSh.)

1 US dollar (USD) = 1.1 Australian dollars AUD)

## DEFINITION OF KEY TERMS

**Definition of key terms and concepts:** Firestone (1987:17) pointed out that definition of terms helps to limit meaning of technical terms that may have multiple meanings. Further, Creswell (2003:143,145) pointed out that dissertations and theses have distinct sections on definitions that clarify terms used in a study. The terms clarified hereunder thus help to clarify the key terms used in the study and to explain the parameters used.

**Agricultural information system:** An agricultural information system is “a system in which agricultural information is generated, transformed, transferred, consolidated, received and fed back in such a manner that these processes function synergically to underpin knowledge utilisation by agricultural producers” (Röling 1988:33).

**Agricultural knowledge system:** An agricultural knowledge system is “a system of beliefs, cognitions, models, theories, concepts, and other products of the mind in which the (vicarious) experience of a person or group with respect to agricultural production is accumulated” (Röling 1988:33). The agricultural knowledge system is described in more detail in **section 4.1.3**.

**Agricultural knowledge and information system (AKIS):** An AKIS is a virtual “network of actors in a theatre of innovation” who make contributions that are complementary towards innovation (Röling 2004:21). An AKIS is an agricultural knowledge and information system that “links rural people and institutions to promote mutual learning and generate, share and utilise agriculture-related technology, knowledge and information” (FAO and The World Bank 2000). The key components of the system are determined by the configuration of actors in the “theatre of innovation” and include farmers, educators, researchers, extensionists, local leaders, NGOs, private sector as well as many other actors who “gel into a synergistic system” depending on the situation (Röling 2004:5,7). The concept of AKIS is discussed in more detail in **section 4.1**.

**Communities of practice (CoPs):** A CoP is a group “of people who share a concern, a set of problems, or a passion about a topic, and who deepen their knowledge and expertise in this area by interacting on an ongoing basis.” CoPs refer to a specific social structure with a specific purpose to create, expand and exchange knowledge and to develop individual capabilities. CoPs bind the whole system around core knowledge requirements by connecting people within and without organisations and across business units, and ensure competitiveness for market share and talent (Wenger, McDermott and Snyder 2002:6,41,42).

**Farmers' group:** A farmer is described as a land user who engages productively in agriculture, either on a full-time or on part-time basis and regardless of whether agriculture forms the principal source of income (South Africa. Department of Agriculture 1995:4). The *Oxford English Dictionary* defines farmer as “one who cultivates a farm, whether as tenant or owner; one who ‘farms’ land, or makes agriculture his occupation.” A farmers’ group is defined as “a collection of farmers interacting with one another towards achieving a common goal.” The interaction between group members may be beyond those outside the group. Membership of a group varies between 20 and 30 people (Madukwe 2006).

**Information:** Sveiby (1997:40) defined information as facts and the communication of facts. Information comprises “ideas, facts, imaginative works of the mind and data of value potentially useful in decision making, question answering, problem solving” (Kaniki 1989:19; 2001). In the context of user-studies, information refers to “a physical entity or phenomena ..., the channel of communication through which messages are transferred ..., or the factual data empirically determined and presented in a document or transmitted orally.” There are three sub-fields or distinctions to information namely: i) facts – assumed to be unhampered by value judgment; ii) advice – assumed to be affected by value judgment; and iii) opinion – assumed to be affected by value judgment (Wilson 1981b; 2006b:659). Information can also be conceptualised in alternative ways and the major assumptions include i) information as a commodity or resource, ii) information as data in the environment, iii) information as a representation of knowledge and iv) information as a part of the communication process (McCreadie and Rice 1999).

**Information behaviour:** Information behaviour covers other behaviours in addition to information seeking behaviour and embraces information on need and its drivers; factors that affect an individual’s response to the perception of need and the processes or actions involved in response (Wilson 1997a:39; 2000). Information behaviour is therefore described as “those activities a person may engage in when identifying his or her own needs for information, searching for such information in any way, and using or transferring that information” (Wilson 1999:249). Information behaviour encompasses information seeking as well as the totality of other unintentional or passive behaviours (such as glimpsing or encountering information), as well as purposive behaviours that do not involve seeking, such as actively avoiding information” (Case 2002:5).

**Information and communication technologies (ICTs):** ICTs cover a range of technologies including “computers, communication, audio and video ..., which have converged towards the point where the technologies that support computers, telephones and TVs are highly interconnected” (Powell 2003:204). ICTs encompass equipment and services that facilitate the

electronic capture, processing, display, and transmission and storage of information. ICTs include computer hardware, software, networks, internet, and related services; electronic data processing and display; telecommunications and related services and audio-visual equipment and services (Torero and von Braun 2006:3).

**Information management:** Information management is “the application of management principles to the acquisition, organisation, control, dissemination and use of information relevant to the effective operation of organisations of all kinds” (Wilson 1997a). Information management entails “working out what information is needed by the people with whom you work, where it might come from, and what they need it for. It involves perceiving information as a resource which your organisation has and which can be consciously used and reused to meet its needs ... Information management is ... a practice or ... a personal competence, which supports and makes easier all the other activities of management” (Powell 2003:1-2). Information management thus involves the generation, representation, organisation, maintenance, use, sharing, communication and disposal of information (Larson 2005).

**Information need:** An information need is a “recognition that your knowledge is inadequate to satisfy a goal that you have” (Case 2002:5). Generally information needs arise when an individual is in a problem situation and cannot manage with the knowledge possessed (Talja 1997:72). An information need is subjective, occurs in an individual’s mind, and can only be stated by the individual or by deduction by observing the behaviour of the person (Wilson 1997b:552-553).

**Information seeking:** Information seeking is a conscious effort to acquire information in response to a need or gap in knowledge and is used in terms of active and intentional behaviour. Information seeking is not always triggered off by the need to solve a problem or make a decision, because at times, one may desire to have more information or assurance or wish to reduce uncertainty (Case 2002).

**Information seeking behaviour:** Information seeking behaviour is defined as “the purposive seeking for information as a consequence of a need to satisfy some goal” (Wilson 2000). The information seeker uses the information and incorporates it with the knowledge that is resident in the mind of the seeker and then makes a decision or solves the problem (Fourie 2004; 2006)).

**Information system:** An information system is “a place where one gets something called information which at best is in some way isomorphic to reality ... and the core of the information system ought to be usings, not users” (Dervin 1996). In other words, an information system is “a

set of interrelated components that collects, processes, stores, analyses, and disseminates data and information within an organisation” (Turban *et al.* 2001:20).

**Information use:** Information use is defined as the “purpose to which information is put once it has been obtained” (Poole 1985:108). In the context of a user for example a farmer, use means “effective, successful or profitable application of the intellectual content of that ... which was produced specifically to improve the optimum sustainable economic yield of his particular enterprise” and is associated to the ‘context’ and the types of use (Abbott 1989:38).

**Innovation:** Innovation is defined as a “social process of interactive inquiry that actors carry out in order to construct or reconstruct their practices ... The main elements are experimentation and networking, which may result in developing new methods and materials (technical, social or other) or in the adaptation of ideas, practices and other elements developed by others. Because innovation requires interaction among actors, it can be seen as the outcome of a process of mutual learning” (KIT 2007b). Innovation is thus the outcome from synergy among actors in “a theatre of innovation” (Röling 2004:3), and is promoted by tools of knowledge management, which provide a platform for the sharing and exchange of experiences (The Delphi Group 2006:11; Maier 2006:6). Innovation is discussed in more detail in **section 4.1.7**.

**Knowledge:** The *Collins English Dictionary* defines knowledge as “the facts or experiences known to a person or group of people.” Knowledge was defined as “what information becomes when it is interpreted” (Sveiby 1997:42). Further, knowledge was viewed as the experience gained over time, including skills and routines by individuals or groups and is created as people process information (Salomon and Engel 1997a:74), while Davenport and Prusak (1998:17) conceived knowledge to be a tangible asset that can provide sustainable advantage to an organisation and pointed out that the new ideas arising from the stock of knowledge in an organisation was limitless where people are given the opportunity “to think, to learn and to talk with one another.” Awad and Ghaziri (2004:33,37) was of the same mind with this definition and described knowledge as the understanding gained by people through experience or study. It is the expertise or know-how that enables people to perform specialised tasks. Knowledge thus includes people’s experiences, “know how” or practices or “applied action” (De Brún 2005:3). In addition, knowledge includes “understandings,” “generalisations,” “abstractions” and insights” that people have and apply in their day to day activities (Wiig 1998). Human knowledge is subjective and is unconsciously determined by language and context, as well as cultural, social, economic, pedagogical and psychological factors (Kuhn 1970:196,202). Knowledge is classified into i) tacit and ii) explicit (Nonaka and Takeuchi 1995; Choo 2000; Von Krough, Ichijo and Nonaka 2000:6; Sallis and Jones 2002:10; Awad and Ghaziri 2004:47); iii) cultural knowledge (Choo 1998, 2000:396); iv) personal,

v) proprietary, vi) public knowledge vii) common sense (Boisot 1998:59); viii) expressed, ix) unexpressed and x) expressible (Kaniki 2005) (see **section 4.1.5**).

**Difference between knowledge and information:** Nonaka and Takeuchi (1995:58) described information as the flow of messages while knowledge is that which is created by the flow of information, which is embedded in the beliefs and commitments of an individual. Bouthillier and Shearer (2002) distinguished information from knowledge based on the dictionary definitions, and described data as information that is factual and can be used for reasoning, discussion or calculation and information as knowledge or intelligence that is communicated. To Bouthillier and Shearer (2002), knowledge is that which we know through experience or being able to apprehend the truth through reasoning, while the ability to apply or understand knowledge is intelligence. On the other hand, information is merely “data in context,” while knowledge is predictive and can be used to guide action. The purpose of knowledge is action, while the purpose of information is understanding (Wiig 2004:73-74). Frappaolo (2006:8) added that knowledge stimulates action in response to conducive environmental conditions, while information does not bring about action. Information can be transformed into knowledge (Fourie 2007:21), and knowledge management includes a blend of information and knowledge (Davenport and Prusak 2000:viii).

**Knowledge management:** Knowledge management facilitates the systematic creation, capturing, sharing, using and recreating of knowledge and is about “learning to know what we know” (Sallis and Jones 2002:3). It has to do with people, and is described as a systematic method for managing individual, group and organisational knowledge (what they know, their social interactions, decision making, information flows and the work culture), using the appropriate means and technology (Sallis and Jones 2002:3-8). In other words, knowledge management is a synthesis of human innovation and information technology (Malhotra 1998). Knowledge management is “the leveraging of collective wisdom to increase innovativeness and innovation (Larson 2005). Abdullah *et al.* (2006) added that knowledge management pertains to how information flows among people, managing people, their knowledge, their social interactions, how they make decisions, how they carry out their activities and includes the application of ICTs. Knowledge management is discussed in more detail in **section 4.1.6**.

**Difference between knowledge management and information management:** Various authors (Davenport and Prusak 1998:3-6; Bouthillier and Shearer 2002 ; Firestone and McElroy 2003:69) have asserted that there is a difference between information management and knowledge management. Most authors agree that information management and knowledge management involve human involvement but their objectives differ and that they complement one another. Bouthillier and Shearer (2002) viewed the primary concern of knowledge management as tacit



knowledge. Tacit knowledge is contained in practice and is action-based, and difficult to describe (Nonaka and Takeuchi 1995). They argued that the main goal of information management is to ensure that information is stored and is retrievable, while that of knowledge management is linked to outcomes of an organisation and sharing of knowledge. Flows of information and information processes could be assessed under information management. On the other hand, a framework could be used to assess contextual information under knowledge management. Information management focuses on control, preservation and retention of information focusing more on preservation and retrieval, while knowledge management focuses more on sharing and creation, viewed as a CoP (Bouthillier and Shearer 2002).

According to Firestone and McElroy (2003:69), both information management and knowledge management refer to processes for handling, directing, governing, controlling, coordinating, planning and organising, but knowledge management pertains to managing people in the sense of creating spaces and opportunities for them to share what they know. It can influence their social interactions in performing tasks, their decision making, the way information flows and their work culture. Knowledge management is thus regarded as an action-leveraging process (Frappaolo 2006:8). While information management focuses on managing how information is produced and integrated into a community or enterprise, knowledge management referred to the same but focused on knowledge (Firestone and McElroy (2003:69). The main difference between the two is that knowledge management focuses more on creating opportunities for sharing tacit knowledge while information management is more geared to managing explicit knowledge and information (Bouthillier and Shearer 2002); information management aims to have information stored and retrieved, while knowledge management focuses more on the outcomes (Davenport and Prusak 1998); and information management focuses on preservation and retrieval, whereas knowledge management focuses on sharing and creation (Bouthillier and Shearer 2002).

**Knowledge and information system (KIS):** Engel (1997:31) used the definition that was advanced by Røling in 1992, who described a knowledge and information system (KIS) as “the articulated set of actors, networks and organisations expected or managed to work synergistically to support knowledge processes, which improve the correspondence between knowledge and environment, and the control provided through technology use in a given domain of human activity.” Although the debate on the definition of knowledge management is still going on, most authors agree on a number of issues including using external knowledge sources, embedding and storing knowledge in processes, products and services, representing knowledge in databases and documents, promoting the growth of knowledge organisation-wide, transferring and sharing knowledge organisation-wide and accessing the value of knowledge assets and impact regularly.

**Local knowledge:** Local knowledge is also referred to as indigenous, traditional, community and rural people's knowledge (Thakadu 1998:3; Rao 2006:224). Several definitions of local knowledge have been advanced. Kaniki and Mphahlele (2002:3) defined local knowledge as “a cumulative body of knowledge generated and evolved over time, representing generations of creative thought and actions within individual societies in an ecosystem of continuous residence, in an effort to cope with an ever-changing agri-ecological and socio-economic environment ... is the sum total of knowledge and skills of people belonging to a particular geographic area which enables them to benefit from their natural environment.” Local knowledge is also defined as “knowledge that people in a given community have developed over time, and continue to develop. It is based on experience, often tested over centuries of use, adapted to local culture and environment and dynamic and changing” and includes information, practices and technologies, beliefs, tools, materials, experimentation, biological resources, human resources, education and communication (IIRR 1996:7-9) (see **section 4.1.5**).

**Small-scale farmer:** The term ‘farmer’ describes sedentary producers, agro-pastoralists and pastoralists. Small-scale agriculture embraces both family-based and communal production. Hirst *et al.* (1988) observed that there is no universal definition of a small-scale farm in developing countries. However, the development literature describes any farm less than five hectares as ‘small’. Small-scale farmers derive their livelihood from holdings of less than two-five hectares (usually less than two hectares); and around 10 to 20 heads of livestock (although often they have less than two or none at all). Small-scale farmers may practice a mix of commercial and subsistence production (in crops or livestock) or either, where the family provides the majority of labour and the farm provides the principle source of income (Narayanan and Gulati 2002; Davis, R. 2006). The World Bank (2003) defined smallholders as farmers with a low asset base, operating less than two hectares of cropland.

**Soft systems:** A soft system is defined as “a human activity system, for example an organisation, a task force, or the stakeholders in agro-ecosystem who have been forced by environmental problems to exert joint agency at the level of social aggregation commensurate with the agroecosystem” (Röling and Wagemakers 1998:16) (see **section 3.2.1.1**).

**Systems thinking:** Engel (1997:24) described systems thinking as an approach for studying the world and intervening in it. “Systems thinking” is a way of thinking of diverse phenomenon that probes and deals with complex situations as a whole, by establishing “one or more constructed abstract wholes or systemic images, which can be set against the perceived world to help us study it” (see **section 3.2.1.1**).

# CHAPTER ONE: BACKGROUND TO THE STUDY

## 1.0 Introduction

Agricultural knowledge and information systems (AKISs) are of interest at local, national, regional and international levels, as they play an important role in facilitating learning through participation, sharing and exchange of agricultural knowledge and information (Engel 1997; Salomon and Engel 1997a; Stefano *et al.* 2005a; The World Bank 2007a). Röling (1989:1-2) defined an AKIS as “a set of agricultural institutions, organisations, persons and their linkages and interactions, engaged in the generation, transformation, transmission, storage, retrieval, regulation, consolidation, dissemination, diffusion and utilisation of knowledge and information, with the purpose of working synergistically to support opinion formation, decision making, problem solving and innovation in a given sector, branch, discipline or other domain.” On the other hand, the Food and Agriculture Organisation of the United Nations (FAO) and The World Bank (2000), defined AKIS as a system that “links rural people and institutions” to promote mutual learning and generate, share and utilise agriculture-related technology, knowledge and information.

As observed by Röling and Wagemakers (1998:15), extension is underpinned by “a body of knowledge and accumulated experience.” In addition, AKISs enable different stakeholders to exploit opportunities and facilitate innovation (FAO and The World Bank 2000; Hoffmann, Probst and Christinck 2007:355). An AKIS delivers knowledge to a clientele and describes a two-way flow of information and knowledge among different sub-systems such as research and users (Bagnall-Oakeley and Ocilage 2002). McDowell (2004) posited that issues related to support for production, marketing and agroprocessing are better handled under the AKIS approach, as AKISs improve linkages and learning across all levels and between different actors (Garforth 2001a; Moussa 2006; Opondo *et al.* 2006). AKISs are also known to contribute to the improvement of extension and advisory services (Carrasco 2001; Garforth 2001a), and to provide opportunities for collaboration, cost sharing in research and dissemination as well as networking (Rees *et al.* 2000:14). In addition, AKISs enable the different stakeholders to exploit opportunities and facilitate innovation (Engel and Salomon 1997; FAO and The World Bank 2000), and are considered essential to the success and development of the community (The World Bank 2007a). As pointed out by Lele *et al.* (2010:64), an AKIS emphasises social and human capital and promotes innovation by facilitating linkages between researchers, extensionists and farmers.

An AKIS advocates the use of “systems thinking” and helps to address in an holistic manner, complex issues and problems inherent in the agricultural sector (Röling and Wagemakers 1998:16). An AKIS also integrates the efforts of the different segments of the system and collects their intellectual capital (Fisk, Hesterman and Thorburn 1998:218; McDowell 2004). Furthermore, the

AKIS approach facilitates shared purpose (Engel 1997; Salomon and Engel 1997a), and helps in managing knowledge and information (Engel and Salomon 1997; Bagnall-Oakeley *et al.* 2004). Rölíng and Jiggins (1998:304) stressed, “It has become common practice to speak about ‘agricultural knowledge systems’.” Knowledge management is, therefore, in harmony with AKIS (see **Chapter four**), and is considered crucial to the running of a good and efficient AKIS (Asopa and Beye 1997a).

In emphasising the importance of collaboration, Engel (1997:23) asserts that, “Extension alone cannot be held responsible for the success or failure of innovation.” Likewise, Pretty and Vodouhe (1997:47) emphasise that interactions and involvement of people from different institutional contexts promote innovation and ownership. While Fisk, Hesterman and Thorburn (1998:218) argue that solutions to complex social problems often emerge from the community members, McDowell (2004) notes that in the past, different actors worked independently of each other. As already observed, the linkages between research-extension-farmer are weak and ineffective (Rees *et al.* 2000; Kristjanson *et al.* 2009:5048). To confirm this observation, empirical evidence suggests that although farmers were among the key actors in AKIS, little attention has been devoted to their needs (McDowell 2004), and especially for women farmers (Kiondo 1998:6). To address these challenges, Senge (2006:218) asserts that communities must collaborate and learn together in order to attain success. Rölíng and Pretty (1997) note that there has been a shift from a teaching to a learning paradigm, and that there is a need to cooperate, share, and exchange the unique knowledge that each actor possesses. As observed by The World Bank (1998), knowledge brings to light preferences, informs markets and illuminates economic transactions. In sum, Dissanayake (1992) states that an “AKIS is ... one of the most significant and productive attempts at theorizing the complex, multifaceted and multivalent process of agricultural knowledge generation, exchange and utilization.”

Various authors (Mchombu 1991; Meyer 2005; Matovelo, Msuya and De Smet 2006), have stressed that information was critical for social, economic and agricultural development and decision making, and that all categories of users including farmers, policy makers and planners, researchers, extensionists, educators and agro-processors need information. In emphasising the importance of information, Stilwell, Leach and Burton (2001:v) note that, “Information has become one of the central features of efforts to chart out a new world.” They observed that the links between information, knowledge and the social aspects of life need to be critically re-assessed to ensure a better understanding of institutional linkages, to identify the complex social changes and to facilitate learning among actors. Powell (2003:153) concurs on the need to understand linkages better, and notes that linkages involve the flow of information and “can and should exist solely for the exchange of information.” As observed by Powell (2003:45), it is the flow and exchange of information that leads to information use and creating value.

Many authors have over the years observed that women dominate the agricultural sector (Mchombu 1999; Meyer 2000:194; UNECA 2009:125) and that rural women in particular play an outstanding role in the agricultural sector (Nederlof and Dangbégnon 2007:374). The agricultural sector employs about 64% of women in Sub-Saharan Africa (UN 2009:20) but despite this, women are the least empowered members of the rural community (IFAD 2002a; 2002b:46). Jones (2006) points out that women are disadvantaged and although they work very hard on farms and in households, they have no scope for increasing labour inputs. Equally noteworthy is that women are often left out or under represented in decision making and policy formulation processes (Kabutha 1998:223; Kiondo 1998:243-244; UNECA 2009:167).

The majority of small-scale farmers have small parcels of land (Bunders and Broerse 1991; Mukhwana, Nyongesa and Ogema 2005; Davis, K. E. 2006). Hirst *et al.* (1988) observed that there is no universal definition of a small-scale farm in developing countries, but the development literature describes any farm that is less than five hectares as “small.” Most small-scale farmers are poor and cannot afford inputs. This non use of inputs has led to a decline in soil fertility and yields, which further lowers the income of farmers and leads to their being caught in the ‘poverty cycle’ (Matovelo, Msuya and De Smet 2006). The call to improve the social and economic situation of small-scale farmers is emphasised by the Low-External-Input and Sustainable Agriculture (LEISA) (2007:4) organisation. It was noted that individual farmer approaches have been slow (Thomas *et al.* 1997), and farmers’ groups were becoming increasingly important in providing agricultural information to farmers (Chamala and Shingi 1997; Place *et al.* 2004:258; Boonyaguakul and Wapet 2005; ILEIA 2007:4; Lightfoot and Scheuermeier 2007:33).

### **1.1 Background to the problem and rationale for the study**

In Africa, where most economies are dominated by agriculture, agricultural and rural development are considered very important as they form the bedrock for effective development (Kaniki 1989:4; South Africa. Department of Agriculture 1995:26; UNECA 2005a; Jones 2006; The World Bank 2007b:1). The agricultural sector has been described as the engine for economic growth and improved livelihoods in Africa (The World Bank 2006b:11,135; Diao *et al.* 2007:5,9). Agriculture is linked to food security and is a primary source of growth and means of poverty reduction (IFAD 2001). As described by Abid (1995:11), agriculture is the “starting point of rural transformation,” and the main economic base for small-scale farmers in Africa (Bunders and Broerse 1991; IFAD 2002a).

The agricultural sector, however, faces unprecedented challenges (Umali and Schwartz 1994:vii; Pretty 1998; Machuka 2001; UNDP 2005:16; UNECA 2005a; 2005b; ID21 2006; The World Bank 2007c; Adesina 2009). Africa has battled with food insecurity and agricultural production for a long time and although poverty levels have fallen globally, Africa is the only developing region where

poverty levels have been rising, where chronic poverty is highest, and where there has been a decline in per capita agricultural production (UNECA 2005b:91,138-140). Most of the land is not arable and only 4% of the arable land is irrigated (The World Bank 2007c:51,65). The situation is further aggravated by the global economic crisis and the escalating fuel and food prices (RoK. National Development and Vision 2030 2008:6; UNECA and AU 2009:2; UN 2009:7).

UNECA (2005a) and The World Bank (2007c:158) point out that the key to reversing this trend is to develop agriculture and industry through science, technology and innovation. A number of poor countries that were dependent on agriculture such as Malaysia, Mauritius, Thailand and South Korea have been transformed into newly industrialised countries (National Economic and Social Council of Kenya (NESC) 2007). This achievement could be attained in Africa through improved agricultural production, especially among smallholders (IFAD 2002b:vi). According to IFAD (2002a), Sub-Saharan Africa needs to accelerate the level of growth to six times that achieved in the 1990s and much of this growth must be in rural areas. However, interactions with and among rural agricultural stakeholders, which would have served to integrate farmers in their own development, have been overlooked and have not been continuous (Abid 1995:11; Musi *et al.* 2004:9). To achieve the targeted growth, increased productivity and the subsequent increase in income, small-scale farmers need to engage in intensive farming on the smallholdings (FAO 2000; IFAD 2002a).

In recognising the challenges that rural communities in Africa face, Mchombu (2001) argues for the need to develop an information provision model that addresses the felt needs and circumstances of this important target group. The limited spaces for sharing local and external knowledge, and the failure by researchers and other actors to involve farmers and farmers' groups in development and the sharing and creation of knowledge, led to information asymmetries (Evgeniou and Cartwright 2005:297) and power asymmetries (Kristjanson *et al.* 2009:5052) respectively. As already stressed, there is an increasing recognition to respond to the technological needs of rural communities in Africa to improve understanding, decision making, innovation, problem solving and the management of their farms and communities.

Madukwe (2006) and Swanson (2009:1) note that the old "top-down" extension<sup>2</sup> model has been replaced by newer extension models and approaches based on farmers' groups, which are now all over Africa (Place *et al.* 2004:258). To support these observations, Davis, K. E. (2004; 2006) provides empirical evidence showing the important role of farmers' groups in pluralistic<sup>3</sup> extension systems.

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<sup>2</sup> The "top-down" extension model was based on an hierarchical linear system from the researcher to the farmer. The model did not allow participation by the farmer, and was perceived to be "supply driven" (RoK. Ministry of Livestock and Fisheries Development, Ministry of Cooperative Development and Marketing 2005).

<sup>3</sup> Pluralistic extension systems are participatory in nature, demand driven and are responsive to farmers' needs. They involve multiple stakeholders such as farmers' groups, NGOs, extensionists and researchers in delivering extension services in a synergistic manner. The extension service providers include the community, public and

This new approach ensures that the technologies developed reach the farmers for which they are intended. The LEISA (2007:4) organisation observed that globally, small-scale farmers have organised themselves into formal and informal groups such as Farmer Field Schools (FFS)<sup>4</sup>, farmers' associations, organisations, unions, cooperatives, alliances, networks, voluntary self help groups and women's groups. Other farmer group approaches include the Promoting Farmer Innovation-Farmer Field School (PFI-FFS)<sup>5</sup> (Critchley and Nyagah 2000:25; Duveskog, Mburu and Critchley 2002) and the Linking Local Learners (LLL)<sup>6</sup> (Braun *et al.* 2007:19). Though debatable, what brings the farmers together is the belief that there is strength in numbers. Most of the groups are founded on community ties, tradition, trust and obligations.

There is increased recognition of the central role that knowledge and information play in social, economic and agricultural development (Röling 1988; Sveiby 1994; Röling and Pretty 1997; Garforth, Khatiwada and Campbell 2003). People have acquired knowledge in different ways in order to understand themselves and their environment (Frankfort-Nachmias and Nachmias 1996:3). Sveiby (1994) points out that knowledge is both a raw material and a function and that information and knowledge are acquired and sold as physical products. In other words, knowledge is equated to land, labour and capital, and needs to be identified, acquired and used to generate value. Sveiby (1997) further argues that the knowledge based economy is already here and knowledge has become a source of wealth. In agreement, Torero and von Braun (2006:1) point out that we live in the information age, which will continuously affect the way we produce, live and do business. Agricultural knowledge and information are vital tools for improving the livelihoods of small-scale farmers (Kaniki 1989; Engel 1997; Meyer 2000; 2003a; Karamagi Akiiki 2006; RoK. Ministry of Agriculture 2006). Knowledge is also perceived to be the most valuable asset in today's world with

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private agencies that provide knowledge and information services. (Chepsaigutt 1997:248; Rivera and Alex 2004:41-42; Muyanga and Jayne 2006:1). The farmer field school (FFS) approach is an example of a pluralistic extension service that promotes horizontal flows of knowledge (Onduru *et al.* 2002).

<sup>4</sup> Farmer Field School (FFS) is a system of farmer knowledge-empowerment based on association with experts that offer technical input (IFAD 2002b:83). FFS are 'schools without walls' that engage in experiential learning (Pretty and Wesseler 2004:7), for improving the decision making capacity of small-scale farmers and stimulating local innovation for sustainable agriculture (Braun, Thiele and Fernandez 2000). FFS offer community-based adult non formal education to farmers through discovery (Duveskog, Mburu and Critchley 2002; Onduru *et al.* 2002).

<sup>5</sup> Promoting Farmer Innovation-Farmer Field School (PFI-FFS) is an approach that was developed to improve uptake of new technologies in East Africa. This approach was supported by the Dutch government and evolved to address challenges of the original FFS and support innovation and local technology development. Farmers were equipped with skills that helped with adjusting and adapting to the environment. The PFI-FFS approach increases interaction between researchers, community innovators and farmers thus resulting in a process of learning through discovery and innovation among farmers (Duveskog, Mburu and Critchley 2002; Friis-Hansen and Egelyng 2007).

<sup>6</sup> Linking Local Learners (LLL) is an initiative in Kenya that networks farmer groups to facilitate learning. The LLL facilitated online mentoring to support 'action learning activities' and stimulate peer to peer exchanges over the internet. The links combine online and face to face exchanges (farmer field school networks) and facilitate brokering of new deals between farmer groups and potential buyers, access to knowledge and information and sharing of practical experiences pertaining to new improved technologies (Braun *et al.* 2007:19; Lightfoot and Scheuermeier 2007).

intellectual property being considered both precious (Oettie and Koelle 2003:9), and a “key resource of the information age” (Sallis and Jones 2002:1). Ferreira and Neto (2005:4) view knowledge as a public good associated with value and wealth. Skyrme (1999) holds the thesis that knowledge gains more value when it is shared. Knowledge should, therefore, be optimised through sharing, using and the “growing” of more knowledge (Kristjanson *et al.* 2009:5049).

In support of the sharing of knowledge, authors have pointed out that local and external knowledge is synergistic and vital for improving livelihoods and economies (Karlsson 1995:53; Pretty 2003a; Kristjanson *et al.* 2009:5048). Garforth, Khatiwada and Campbell (2003) argue that while local knowledge provides the ideas and momentum for change in agriculture and other areas, external information could result in fresh ideas and awareness of new opportunities that may lead to paradigm shifts and new practices. In a related study, Choo (1998) emphasises the importance of organising the potential value of knowledge that is external to a particular community, and exploiting it to create knowledge that is new to the community. FAO and The World Bank (2000) add that such exploitation of existing technologies require the dissemination of knowledge on how to put the technologies into appropriate use.

Röling and Pretty (1997) noted that although local knowledge was valuable, it was underused, or as pointed out by the International Institute for Rural Reconstruction (IIRR) (1996), Röling and Pretty (1997), Ngulube (2002) and McDowell (2004), it has been ignored over many years. These observations have led some actors to conclude that knowledge and skills are essential resources for farming and studies on ways in which farmers obtain and share knowledge could be valuable to farming systems research and extension, informing policy and leading to more efficient farming (ETC East Africa 2000; Hoffmann, Probst and Christinck 2007:355). Previously, Mundy and Compton (1995) observed that external technical information is only a small fraction of the messages farmers receive through indigenous communication channels. In stressing the importance of local knowledge, Oettie and Koelle (2003:9) note that rural communities have a ‘great strength’ – that is, their local knowledge and ‘know how’ about medicinal plants, environmental management and sustainable traditional agricultural practices. This knowledge guides decision making, problem solving, innovation and understanding (IIRR 1996:3; Ngulube 2002; Stefano *et al.* 2005b). Probst, Raub and Romhardt (2000:1) therefore argued that the sharing of local knowledge is crucial in ensuring the survival and competitiveness of actors.

Information about new knowledge, innovation and technology need to be shared if it is to have the desired impact on the intended beneficiaries. To facilitate this sharing, players in the public and private sectors have used various information and communication technologies (ICTs) such as radio, television (TV), cellular phones and internet to share and disseminate agricultural innovation,



knowledge and information and there are a number of successful initiatives where the benefits of ICTs have been harnessed for improved livelihoods (Heeks, 2007; Karamagi Akiiki 2008; Ferris, Engoru and Kangazi 2008; Gakuru, Winters and Stepman 2009:2). Parallel to the potential of ICTs are a number of challenges associated with the use and application of ICTs that have led to the urban–rural digital divide and various authors (Iibuodo 2003; FOODNET 2007; Heeks 2007; Munyua 2007) point out a number of constraints including inadequate local content, weak infrastructure, and high licence fees.

Equally noteworthy is the effort of development partners who have set up a number of initiatives, projects, networks and systems that are using modern ICTs to improve linkages and flows for agricultural knowledge and information (FAO 2001; 2003). For example, the FAO (2001) has developed the Farmer Information Network (FarmNet<sup>7</sup>), piloted in Latin America and Africa, and focusing specifically on farmers' groups. Another innovation is a prototype Virtual-Research Communication Network (VERCON<sup>8</sup>) that provides data, information and knowledge on technical farming practices, weather, markets and events and has been piloted in Egypt. The VERCON is expected to be rolled out to other countries in Africa (FAO 2003). In addition, a number of public access centres or telecentres have been established in rural areas in developing countries including Kenya, South Africa and Uganda, to improve access to agricultural information and enhance agricultural production (Benjamin 2001; Karamagi Akiiki 2006; Ochieng and Waema 2009; Stilwell and Munyua 2009). African governments have also supported initiatives in under-served areas by subsidising the lowest competitive bidder and using universal access funds to support disadvantaged areas (The World Bank 2006d).

Some advances have been made in using ICTs to facilitate the capturing, processing and sharing of knowledge, but much local knowledge is tacit, and traditional methods have principally been used to capture and share knowledge and information (Mundy and Compton 1995; The World Bank 1998). Opportunities where ICTs could improve linkages between actors and improve the flow of knowledge and information to small-scale farmers and AKIS have not been fully exploited. In fact, a number of initiatives in Africa suggest that the use of ICTs in small-scale agriculture is urgent if the MDGs<sup>9</sup> and World Food Summit (WFS)<sup>10</sup> milestones are to be achieved (UNECA 2005a).

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<sup>7</sup> Farmer Information Network (FarmNet) is an electronic network of rural people who use ICTs to facilitate the generation, gathering and exchange of knowledge and information among farmers and other intermediaries for improved livelihoods. The network empowers farmers through participatory networks that are farmer managed (FAO 2001).

<sup>8</sup> The Virtual Extension and Research Communication Network (VERCON) uses the internet to strengthen and enable linkages among the research and extension components of the national agricultural knowledge and information system. The VERCON's goal is to improve the agricultural advisory services provided to farmers through strengthened research-extension linkages (FAO 2003).

<sup>9</sup> The United Nations Development Programme (UNDP) has developed eight Millennium Development Goals (MDGs) to be achieved by 2015 in response to the world's main development challenges. The first of these goals concerning poverty and hunger, aims to reduce the proportion of people living on less than a dollar

Between 1983 and 2002, Kenya experienced rapid economic decline, falling standards of living and overall very poor economic performance (UN 2001:5; Gerdin 2002:12; The World Bank 2004a; RoK. KNBS 2006). Growth of the agricultural sector declined over the years from 4.4% in 1996 to a record -2.4% in 2000 (RoK. Ministry of Finance and Planning 2006; RoK. KNBS 2006). The downward slide was reversed from 2002 (1.8%) to 2005 (6.9%) (RoK. National Development and Vision 2030 2008), after the National Rainbow Coalition (NARC) government took steps to improve the agricultural sector in line with the Economic Recovery Strategy (ERS), and an appreciation of the need to remain competitive through the exploiting of science, technology and innovation, learning from the past, building on its strengths and tapping into new opportunities (RoK. Office of the President 2006). At the time two of the strategic objectives of Kenya's Ministry of Agriculture (RoK. Ministry of Finance and Planning 2006:16) were to facilitate increased productivity and agricultural outputs through improved extension advisory support services and technology application; and to improve access to agricultural information through ICT-based information management systems.

Despite these noble objectives and the ERS, growth rate of the agricultural sector dropped to 2.3% in 2007 (RoK. National Development and Vision 2030 2008), and to -5.1% in 2008, because of the December 2007 post-election crisis (RoK. National Development and Vision 2030 2008:3), drought and the adverse climatic conditions (RoK 2009:14). The 2008 - 2009 increases in food prices also had a negative impact on the agriculture sector (Mukhebi, Mbogoh and Matungulu 2010:5-6). An important point to note is that the agricultural sector is not only important for social and economic development in Kenya, but is central to delivering other regional, pan-African and global commitments such as the MDGs on poverty and hunger (RoK. Ministry of Finance and Planning 2006:1-2).

Various authors (Salomon and Engel 1997a:13; Madukwe 2006) observe that although extension workers<sup>11</sup> or change agents have acted as intermediaries between the researchers and farmers, extension services are constrained, under pressure and ineffective. In addition, it was observed that meaningful dialogue between agricultural researchers and extension workers should be underpinned by recognition of the rural people's knowledge (Kristjanson *et al.* 2009:5048), and the complex and

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a day and those who suffer from hunger by a half by the year 2015. The UNDP is working with different countries to monitor and achieve this goal. In this context, many of the best practices have risen from linking national Poverty Reduction Strategy Papers to the MDGs (Sanchez *et al.* 2005; UNDP 2007).

<sup>10</sup> Heads of state of about 180 countries met at the Food and Agriculture Organisation of the United Nations (FAO) headquarters at the World Food Summit (WFS) and charted ways of eradicating hunger and reducing the number of undernourished people by half by 2015. Organisations and individual countries therefore have the target of the WFS at their base (FAO 2007).

<sup>11</sup> An extension worker or change worker is a professional who facilitates change by providing agricultural advisory services to farmers and information and knowledge through adult education on the entire production to consumption continuum to agricultural producers.

differentiated process of generation, transmission and adoption of knowledge by communities (Scoones and Thompson, 1994:28,32). It was largely accepted that extension services have failed to reach the majority of farmers in many developing countries and to produce the desired result (Chapman *et al.* 2003:3; Richardson 2006), and Kenya is no exception (Rees *et al.* 2000; RoK 2005a:2; RoK. KNBS 2008b). These observations were confirmed by empirical findings (The World Bank (2006a; 2009:18) which revealed that extension services in Africa have been downsized or phased out altogether and/or have limited resources. As stressed by Salomon and Engel (1997a:13), extension should be seen as “facilitating networking for innovation.”

There have been reforms of research and extension services delivery aimed at strengthening the linkages between farmers’ demands and the supply of improved technology and advice. Policy and institutional reforms were planned for key commodities including coffee, to increase the competitiveness of the produce on international markets. As part of the reforms, the Agricultural Technology and Information Response Initiative (ATIRI) was launched by the Kenya Agricultural Research Institute (KARI 2007) in response to the technology, knowledge and information needs of farmers. ATIRI works with partners through appropriate participatory approaches to disseminate innovative technologies and knowledge to farmers. In support of the current government’s extension policy, which advocates working with farmers’ groups (Davis, K. E. 2006), The World Bank (2004:25-26) is supporting government efforts to transform research and extension systems to be more demand-driven and farmer-led through the Kenya Agriculture Productivity Project (KAPP). Research findings by Davis, K. E. (2004; 2006) suggest that there are many types of groups in Kenya, which are acting as “extension groups” and disseminating agricultural information and knowledge and training other farmers. These findings call for further studies on farmers’ groups and their role in extension systems, sharing of knowledge and information, and agricultural innovation.

Empirical studies have been carried out in Kenya and globally on AKIS including Europe (Boonekamp *et al.* 1996; Klerkx and Leeuwis 2009), the Netherlands and Central America (Engel 1997:12), Fiji (Bachmann 2000), Africa (Rees *et al.* 2000; Garforth 2001a; Bagnall-Oakeley and Ocilaje 2002; Stefano *et al.* 2005a), Latin America (Carrasco (2001), the United States of America (USA) (McDowell 2004) and Asia (Best *et al.* 2005). Findings from these studies have led to calls for improved linkages and partnerships among key actors. For example:

- In his study of stakeholder interactions and inter-organisational relationships in the Netherlands and Central America, Engel (1997) examined how different actors organise themselves to achieve innovation. He suggested the need for further research in understanding knowledge management.

- Bachmann's (2000) study reviewed agricultural knowledge systems in Fiji and the limitations of participatory methods and existing platforms for promoting innovation development. The study focused on research and extension departments of the Ministry of Agriculture.
- In the study of AKIS in Havana City Province in Cuba, Carrasco (2001) focused on the role of extension programs in contributing to food security. This study focused on an urban setting and identified the role of extension. It also proposed a generalised holistic model. However, the AKIS of rural areas is different from that of urban areas.
- McDowell (2004) observed that even in the USA where there is a myriad of knowledge and information systems to support and regulate agricultural activities, the AKIS was more influenced by politics, rather than by farmers' needs. This study pointed to the need for exploring farmers' needs as drivers of AKIS.
- A study on AKIS in Bangladesh identified information needs of farmers and partner and target organisations to support extension activities, improve access to information for more informed decision making among the rural poor and strengthened interventions on information provision (Best *et al.* 2005).
- Klerkx and Leeuwis (2009) examined the functions of privatised AKIS in the Dutch dairy sector and showed network brokers' attempts at improving interaction in privatised AKIS were partisan and could not meet the full information needs of farmers and suggested support to public extension services.
- A study of a local AKIS in Eritrea focused on developing methods for analysis that can be used in dialogue between farmers and advisors (Garforth 2001a). Garforth's study observed local variations in AKIS and focused on opportunities for improving linkages, training, participatory adaptive research and improving the reliability and exchange of information.
- The study of AKIS by Bagnall-Oakeley and Ocilaje (2002) in Uganda pointed out that non-governmental organisations (NGOs) and other organisations had a wealth of knowledge and experience that was beneficial to farmers. ICTs such as radio and cellular phones were found to be an important source of agricultural information but there were challenges with broadcast schedules, limited coverage of cellular phones and cost. Bagnall-Oakeley *et al.* (2004) also developed and tested a methodology for mapping and understanding farmer's local agricultural knowledge and information systems in Uganda. Their study further examined the indigenous information network in Uganda and points to an opportunity to study local knowledge networks in Kenya.
- In South Africa, Meyer (2000; 2003b) suggested a merger model that combines the local knowledge system and the modern information system, which uses traditional communication channels to deliver external information that augments farmer's local knowledge, identifies the flow of knowledge and information and assesses the linkages between stakeholders. Stefano *et al.* (2005a; 2009) used action research to investigate the AKIS of small-scale commercial organic

farmers in South Africa. Stefano's study identified external knowledge and information required to support certified organic production and marketing, as well as ways to link farmers' traditional agricultural knowledge to relevant internal and external knowledge and information sources and channels. Worth (2006) proposed the Agriflection extension and learning model for smallholder agriculture arising out of new thinking about extension and strengthening the capacity of agricultural actors. The model promotes a culture of continuous learning and suggests that prosperity is attainable through engaging small-scale farmers in technology development, innovation and scientific discovery.

- In their study of AKIS of four districts in Kenya, Rees *et al.* (2000), focused on smallholder farmers, community based organisations and other relevant actors such as women's groups, church groups and youth groups. The study indicates a need for a comprehensive investigation on the role of small-scale farmers' groups.
- Davis, R. (2006b) examined the role that dairy goat farmers' groups play in disseminating innovations in Meru district, Kenya. This study suggested the need to investigate the role that farmers' groups play in managing local agricultural knowledge and information among small-scale farmers.

A number of authors have called for further research in AKIS (Bachmann 2000; Rees *et al.* 2000; Bagnall-Oakeley and Ocilaje 2002; Stefano 2004; 2005a; Davis 2006a; Karami 2006). Dissanayake (1992) suggested that issues of culture and power needed to be incorporated in the AKIS framework. Röling (1989:34) pointed out the need to study the way in which people use information sources, process information and utilise knowledge. Muktasam and Chamala (2001) observed the need to focus on how groups access knowledge and promote learning. On the one hand, Ferreira and Neto (2005) proposed the improvement of social learning and knowledge in the context of development, while Moussa (2006) suggested the need to revise the linkages between researchers and extensionists with farmers, and to include other actors. Furthermore, the Royal Tropical Institute (KIT) (2007a) stressed that there was a need to strengthen AKIS, especially the agricultural research, extension and education sub-systems and argued that one key question to be addressed was how knowledge-based service provision could become "more demand-driven and how farmers themselves can become empowered actors in the agricultural innovation system."

Much has changed in Kenya since the comprehensive study by Rees *et al.* (2000) and other authors (Hooton *et al.* 2006; Karanja and Ouma 2006), and there is a need to build on their work. The studies by Rees *et al.* (2000) and Garforth (2001a) pointed out that the AKIS of smallholders is complex and diverse and varies from site to site based on agroecology and agricultural enterprise. There is increasing empirical evidence that supports the importance of small-scale farmers in agricultural production (Rees *et al.* 2000; Garforth 2001a; Davis 2006a). Although research has been conducted

and many new improved technologies have been developed, linkages between research, extension, civil society organisations (CSOs) and farmers have remained weak (Den Biggelaar and Mugo 1996; Rees *et al.* 2000), and often improved technologies have neither reached nor been adopted by their intended beneficiaries (FAO and The World Bank 2000; Garforth 2001a; 2001b). On the one hand Alemna (1995) observed that farmers need to adopt high-yielding technologies, while on the other, Röling and Wagemakers (1998:10) pointed out that farmers are expected to become ‘experts’ in external wisdom and technologies (not mere adopters of technology). Röling and Wagemakers (1998) emphasised the point that farmers need to adapt the new practices to suit their local situation.

In Kenya, weak and ineffective research-extension-farmer linkages were identified as one of the key barriers to attaining full agricultural potential (Rees *et al.* 2000; RoK 2005a:2; RoK. KNBS 2008b). Many other barriers have been identified such as poor access to agricultural information, (RoK 2002; 2005:4; 2006). Kenya’s 9<sup>th</sup> Development Plan (2002-2008) has adopted a participatory approach to development by appreciating the roles of NGOs, community based organisations (CBOs), the private sector and religious organisations. Further, the government emphasised the importance of empowering local communities (through the use of participatory methods) in the implementation of programmes and projects (RoK 2002:22; 2005:4).

The available literature points to the need to understand the role of local and external knowledge - how it is created, shared and used. Rees *et al.* (2000) suggested that there are great variations of AKIS depending on agroecological zones and other factors in different communities. The FAO and The World Bank (2000) observed that the needs of farmers are not driving the orientation of research and extension. Wiig (2003) shared this observation and argued that although authors have focused on the roles of knowledge at individual level, studies on holistic systems have received little attention. As Smith (2005) argued, there is no single right way of sharing knowledge but rather, knowledge sharing activities are determined by the perceptions of individuals and groups and the network<sup>12</sup> of people with whom they socialise. A number of authors have suggested the need for further research on the integration and sharing of knowledge from different sources (Meyer 2000; 2003b). In addition, Kaniki (1989), FAO and The World Bank (2000) and Richardson (2006) asserted that an understanding of linkages between information producers, users, their information needs as well as their information seeking behaviour would help improve linkages and the flow of knowledge and information. Some progress has been made in using ICTs to facilitate the capturing, processing and sharing of knowledge.

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<sup>12</sup> A knowledge network is a group of individuals with a common interest or in a given area or knowledge domain that share and exchange information and knowledge that is beneficial to members (Engel 1990).

A number of initiatives in Africa suggest that the use of ICTs in small-scale agriculture is urgent if the MDGs and World Food Summit (WFS)<sup>13</sup> milestones are to be achieved (UNECA 2005a). African governments have also supported initiatives in under-served areas through subsidising the lowest competitive bidder and universal access funds that have been used to fund disadvantaged areas (The World Bank 2006d). An AKIS study has not been undertaken in Kirinyaga district - a high agricultural potential area with a high population. The district provides a good entry for the study of AKIS, because 80% of the land is arable and 99% of this land is under agriculture. The district is characterised by many small-scale farmers who keep dairy cattle and grow cash crops and subsistence crops for household consumption, local market and export. A number of farmers have adopted improved farming methods and there are several project-led activities in the area, including adoption of high value crops, irrigation and ICT initiatives. Many farmers' groups have been formed and some have adopted new improved technologies. Some of the farmers have been trained and have become GlobalGAP (formerly EurepGAP)<sup>14</sup> certified (ICIPE) 2005:98). Furthermore, the attractiveness of Kirinyaga district as a site for an AKIS study is further strengthened by the fact that one of the sub sector priorities of the district is to encourage adoptive research and improve linkages between research and extension services (RoK. Ministry of Finance and Planning 2002a).

In addition, Kirinyaga district faces immense challenges including the small landholdings (average farm sizes of 1.2 hectares), declining productivity in agriculture and livestock, poor communication networks, inadequate potable water supply, social problems such as poverty, gender inequality and low incomes and a varied tropical climate. More significantly, the farmers do not have adequate access to agricultural information and knowledge on production, post-harvesting and agroprocessing, markets and opportunities (RoK. Ministry of Finance and Planning 2002a). The agricultural potential of the district, population, poverty level, diversity and availability of farmers' groups make Kirinyaga district a good entry point for studying AKIS.

Given the importance that the government of Kenya, development organisations and other actors have placed on the formation of groups to facilitate access to support, knowledge, information and training, the study investigated linkages and flows of knowledge and information among the key

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<sup>13</sup> Heads of state of about 180 countries met at the Food and Agriculture Organisation of the United Nations (FAO) headquarters at the World Food Summit (WFS) and charted out ways of eradicating hunger and reducing the number of undernourished people by half by 2015. Organisations and individual countries therefore have the target of the WFS at their base (FAO 2007).

<sup>14</sup>GLOBALGAP (formerly EurepGAP) is a private company that sets standards for the certification of agricultural products around the world. GLOBALGAP comprises agricultural producers, retailers, farmers and associate members from the agricultural input and service sector that establish certification standards and procedures for GAPs. The certificate covers the process of the certified product from the pre-seed planting phase to the phase when the product leaves the farm. EurepGAP aims to maintain consumer confidence in food quality and safety and acts as a business-to-business label. It works towards minimising negative environmental impacts of farming operations, optimising use of inputs and promotes approaches to worker health and safety (EurepGAP 2007; GLOBALGAP 2010).

actors in Kirinyaga district in Kenya with special focus on small-scale farmers' groups. The study further examined how key actors support sharing and exchange of agricultural knowledge and information, the role of ICTs in the sharing and exchange of agricultural knowledge and information and current agricultural knowledge management and information management practices in Kirinyaga District. This study therefore addresses an area that was previously not sufficiently covered.

## **1.2 Statement of the problem**

Agriculture has been linked to food security and is a primary source of growth and means of poverty reduction in Africa (IFAD 2001; Mukhebi, Mbogoh and Matungulu 2010) but agricultural productivity continues to decline in Africa (RoK. Ministry of Finance and Planning 2006:x,1; UNECA 2005b:138), and new markets and market opportunities continue to elude the farmers (Lightfoot and Scheuermeier 2007; Mukhebi *et al.* 2007). Poverty and hunger are prevalent in Sub-Saharan Africa (MDGs Technical Support Centre 2004; Von Braun, Hill and Pandya-Lorch 2009:3) and are increasing, especially in rural areas (IFAD 2002b:1; The World Bank 2007c:26). Increased productivity in the agricultural sector is therefore crucial and this must be underpinned by agricultural knowledge and information. Indeed, authors have suggested a cause-effect relationship between the lack of information and slow development of the agricultural sector (Aubrac 1977). Röling and de Fliert (1998:157-168) concluded that farmers needed to learn how to adapt the new practices to suit their local situation, and on how to manage their ecosystems and their resources, as exemplified by the integrated pest management (IPM) programme approach where farmers were trained and became 'experts', leading to a high multiplier effect and large-scale adoption of IPM.

The ineffective public extension services led to farmers all over the world forming formal and informal groups based on community ties, tradition, trust and obligations as an alternative (ILEIA 2007:4). These groups have enabled the public extension service to provide an alternative path to development and access to advisory services through linking farmers' groups to knowledge and information networks (ILEIA) 2007:4). As noted by Pretty (2003a:5) and Pretty and Wesseler (2004:3), people have worked collectively for a long time to manage natural resources, share labour and market their produce, but the importance of the "connectedness" of such groups has only recently become organised. Benefits to operating under groups were noted (Dyck 1997; FAO 1998; Madukwe 2006; Opondo *et al.* 2006), and the lessons learned suggest the need to build upon existing groups with a history of social capital activities (Opondo *et al.* 2006; Hoffman, Hoelscher and Sherif (2005). Pretty and Vodouhe (1997:50) pointed to the need for a shared perception, which is essential for collective action needs and stressed the importance of understanding the complexity of actors in learning and sharing information and knowledge.



It is, however, a paradox that Africa, and Kenya in particular, has failed to achieve agricultural growth despite the many new technologies developed, new approaches to development, and the many agricultural development actors. Although resources have continued to be invested in the sector, it would appear that small-scale farmers have been neglected. If agricultural knowledge and information are important:

- Why is knowledge and information underutilised (Abbott 1989:2; Buchanan-Smith, Davis and Petty 1994; Aina, Kaniki and Ojiambo 1995; IIRR 1996; Adomi, Ogbomo and Inoni 2003; Harris 2004)?
- Why are research results, market information and best practices not reaching the farmers (Davis, R. 2006; Madukwe 2006; Braun *et al.* 2007:19)?
- Whom are information providers serving (Abid 1995; Choo 2000; Awad and Ghaziri 2004)?
- How are the disadvantaged discovering what they need to know (Aina 1995; Davis, R. 2006; Wilson 2006a:683)?
- Why are researchers developing inappropriate technologies that are not relevant for small-scale farmers (Jones 2006; Madukwe 2006)?
- Who are the actors in rural communities (Salomon and Engel 1997a)?
- Are farmers, extensionists, researchers and other actors equal partners (Röling and Wagemakers 1998)?
- What linkages exist between the different stakeholders (Engel 1997; Salomon and Engel 1997a; Röling and Wagemakers 1998; FAO and The World Bank 2000)?

Poverty remains one of the key challenges that the government of Kenya has to contend with (RoK. Office of the President 2006; NESC 2007, RoK. National Development and Vision 2030 2008:3). Food insecurity increased to about 50% in 2005 and potential for increased production was unexploited (RoK 2005a). The observed poverty and food insecurity have been partly attributed to poor performance and growth of the agricultural sector (RoK 2004; 2005a; RoK. Ministry of Finance and Planning 2002b:20; RoK. Ministry of Agriculture 2006). The situation has been compounded by the weak agricultural extension services characterised by insufficient and outdated technical messages, inadequate staff, poor mobility of staff (Chepsaigutt 1997:248), and top-down technology development and dissemination, which were ineffective and inefficient in solving farmers' problems. There was a low adoption of research outputs (Oggema 1997:1) and most small-scale farmers were resource poor and could not afford farm inputs, which led to poor yields (Micheni and Gathama 1999:28; The World Bank 2009:6).

Small-scale farmers often lacked business acumen, collective action, storage facilities, transport, market information and capital to invest, and were trapped in the “good season poor market” dilemma (Mukhwana, Nyongesa and Ogema 2005:7,8,30). Rapid population growth in “areas

suitable for rain fed or irrigated agriculture” has resulted in most arable land being subdivided into small farms under subsistence farming. Such farms suffer from poor cultivation practices that contribute to soil and environmental deterioration including soil fertility decline. Other challenges include inadequate markets and marketing infrastructure, natural disasters, soil and environmental degradation (RoK. Ministry of Finance and Planning 2002b:20; The World Bank 2009:7). The poor linkages between agricultural actors, declining agricultural productivity, poor access to market information and agroprocessing, and limited agricultural information and knowledge for farmers make it necessary to understand the AKIS of small-scale farmers in order to improve livelihoods of rural communities.

### **1.3 Purpose of the study**

The purpose of this multiple methods study was to understand small-scale farmers as key actors in supporting agricultural development and linkages between key actors (especially farmers’ groups), their information behaviour, sources of information and knowledge, linkages and flows of knowledge and information (including the role of ICTs), usage of these resources and barriers to accessing knowledge and information. The study also aimed to investigate the existing knowledge management and information management practices and to suggest an AKIS model for small-scale farmers in Kirinyaga district. In this study, a triangulation of complementary paradigms, theories, methodologies, observers and data collection methods were used. The reason for collecting both qualitative and quantitative data was to bring together the strengths of both forms of research to corroborate and validate results.

### **1.4 Objectives of the study and research questions**

The research objectives investigated in the study and the research questions that apply to each objective were:

***Objective 1: Identify the information behaviour of small-scale farmers.***

- 1.1 What are the information and knowledge needs of small-scale farmers (men, women and the youth)?
- 1.2 How do small-scale farmers go about seeking information and knowledge (men, women and the youth)?
- 1.3 Which farmers’ groups are in place in Kirinyaga district? What are their characteristics and what roles do they play in facilitating the exchange and sharing of knowledge and information?

***Objective 2: Identify sources of local knowledge and external information.***

- 2.1 Where do farmers get their agriculture-related information?
- 2.2 Who uses the agricultural knowledge and information of the information providers?

2.3 What AKISs (relevant to small-scale farmers) are present in the district? What are the key features of the system(s)?

**Objective 3:** *Investigate the linkages and flows of knowledge and information between stakeholders and channels of communication.*

3.1 Who are the primary stakeholders (researchers, extensionists, educators, NGOs, CBOs, farmers and other stakeholders)?

3.2 How does information and knowledge flow between the key stakeholders? (Social ecology of groups).

3.3 What linkage mechanisms exist between actors? What types of linkages exist between actors?

3.4 What communication media do actors (including farmers / farmers' groups) use (men, women and the youth)?

3.5 Are ICTs used to share and exchange information? What ICTs do actors (including farmers / farmers' groups) prefer to use and why (men, women and the youth)?

**Objective 4:** *Assess the usage of knowledge and information.*

4.1 What types of information and knowledge do farmers obtain?

4.2 How do farmers make decisions that deal specifically with risk?

4.3 Can farmers relate specific instances when a major decision or innovation was made, understanding gained or problem solved as a result of knowledge or information?

4.4 What knowledge and information helped make the decision(s) or solve the problem or innovate?

4.5 Were farmers satisfied with the decision(s) / innovation / solution? If so/not why?

4.6 What processes are involved in group decision making?

4.7 How does individual farmer decision making differ from group decision making?

4.8 Is the knowledge and information available in the AKIS sufficient for addressing the needs of farmers? If not, how do farmers go about seeking external information?

4.9 What problems / constraints do small-scale farmers / groups face in accessing agricultural knowledge and information?

**Objective 5:** *Determine the current practices in managing local knowledge and external information among farmers' groups.*

5.1 What systems are in use for managing agricultural information?

5.2 What systems are in use for managing local agricultural knowledge?

**Objective 6:** *Suggest an AKIS model for small-scale farmers in Kirinyaga district.*

**Appendix 1** presents a summary of objectives, research questions and data collection methods.

### **1.5 Assumptions of the study**

This study was based on the following assumptions:

- 1.6.1 Knowledge and information underpin agricultural development in rural areas.
- 1.6.2 Small-scale farmer organisations have knowledge and information needs that have not been met through the available AKIS.
- 1.6.3 Knowledge processes among small-scale farmers are socially constructed and the farmers influence and manage the knowledge processes to produce information, and there is an interrelationship between knowledge, communication and information.
- 1.6.4 An AKIS that responds to changing user needs is necessary for understanding, innovation, decision making and problem solving.
- 1.6.5 An improved AKIS taking into consideration social inclusion, local knowledge, external information, farmers' needs and ICT preferences will meet the needs of users and therefore enhance the sharing of knowledge and information.
- 1.6.6 There is a link between knowledge and information, technology and innovation.
- 1.6.7 The desired outcomes of an AKIS include innovation, learning, sharing of knowledge and information, technology transfer and improved agricultural productivity among others.

### **1.6 Paradigms, theoretical framework and methodology**

The study of AKIS is complex, and hence requires a triangulation of paradigms, theories, methodologies and data collection methods to be able to study the different aspects of an AKIS, which is multidisciplinary and multi-faceted in a comprehensive manner. Easterby-Smith, Thorpe and Lowe (2002:27,31) asserted that there is a relationship between research paradigm, theory and research method. While a paradigm provided a way of looking at phenomena, theory aimed to explain what is observed (Wagenaar and Babbie 2001:18,19). Aligning philosophies and methods helps to avoid confusion, ensure that research objectives are achieved and provides an opportunity to discuss theory, methods and the research process (Knox 2004). This approach helped the researcher to take a more informed decision about the research approach, decide on appropriate methods for the research and think about constraints that may impinge on the study.

This study adopted a pluralistic paradigmatic approach and triangulated several paradigms and perspectives as suggested by many authors (Kuhn 1970:79,110; Dervin and Nilan 1986; Dick 1993:54; Bryman and Bell 2003:12; Denzin and Lincoln 2005a:189; Creswell and Plano Clark

2007:26,95,104), who pointed out that research studies can use aspects of more than one paradigm in order to be consistent and coherent with the research questions, and to provide an understanding of phenomena from different philosophical view points. As pointed out by Styhre (2003:27), postmodernists acknowledge pluralistic approaches to questioning of ideas, multiple understandings and questionings of the perception of advancements, and recognise that there are inconsistencies, unclearness, conflicting ideas and rifts. This study is therefore based on pluralistic paradigms and perspectives comprising (see **sections 3.1.2** and **3.2.1**):

- i) The Social constructivist paradigm (combined with Interpretivism and Naturalistic inquiry), which supports the learning process and helped the researcher to understand how the social world of small-scale farmers gets constructed (Röling and Wagemakers 1998:13; Patton 2002:104; Creswell 2003:6; Creswell and Plano Clark 2007:20-22; Schunk 2008:236,516).
- ii) Phenomenology interpretive paradigm, which provides a deep understanding of phenomenon or experiences encountered in everyday life, and describes things and experiences through senses as opposed to intuition or reasoning (Patton 2002:104). The Interpretive paradigm, which helped the researcher to understand what was expressed by farmers in their own language, their actions and viewpoints as signified by the facts used mostly (Diesing 1991:124; Hunt 1991:35; Gephart 1999; Snape and Spencer 2003:7; Terre-Blanche and Durrheim 2006:9; Cohen, Manion and Morrison 2007:21-22).
- iii) The Naturalistic paradigm, which guided inquiry on studying information and information use (Dervin and Nilan 1986; Kirk 1997:257).
- iv) Participatory paradigm, which places communities and people as part of their world, and calls for the need to be “situated,” “explicit,” and to see people as “part of the whole” and allow for collaboration (Heron and Reason 1997; Reason and Bradbury 2001:7; Creswell 2007:21; Creswell and Plano Clark 2007:23).

The study is further guided by various perspectives including the Soft systems approach, Systems thinking approach, Knowledge systems and the Knowledge and information systems (KIS) perspectives, Knowledge management theory perspective and Communities of practice (CoPs) (see **section 3.2.1**). The study was constructed upon an integration of theories (Sense-making, Social cognitive), concepts (Social capital), models (Wilson and Meyer) and frameworks (Cynefin), as justified by Pretty (1994:38) who pointed out that triangulation of theories is necessary to ensure proper interpretations of the world, and for seeking objectivity. These are described in **section 3.2.2**.

In addition to the pluralistic paradigmatic and theoretical approach, this multiple methods research study adopted a triangulation of methodologies comprising the qualitative, quantitative (Tashakkori and Teddlie 1998; 2003; 2008; Greene and Caracelli 2003; Teddlie and Tashakkori 2003; 2009; Greene 2008; Hesse-Biber 2010); Participatory methodology (Pratt and Loizos 1992); Sense-Making

methodology (Dervin 1992; 1998; 1999; 2005; 2006; 2007; Dervin, Foreman-Wernet and Lauterbach 2003; Romanello, Dervin and Fortner 2003; Clark 2005; Dervin and Reinhard 2006; Naumer, Fisher and Dervin 2008); and the Soft systems methodology, which was used to identify actors and potential actors, identify opportunities to improve a knowledge and information system, create awareness among relevant stakeholders and to link the different activities by diverse agricultural actors into a purposeful whole (Checkland and Scholes 1990; Checkland 1999; 2000 (see **section 5.1**).

The study population was small-scale farmers in Kirinyaga district (individuals and groups), information providers and key informants. Cluster sampling was used to draw the sample of farmers' groups and farmers belonging to farmers' groups. Selection of clusters was guided by a predefined criteria and the basis of the clusters was sub-locations. The sample of farmers who did not belong to a farmers' group was drawn using snowball sampling. The selection of key informants was through purposive sampling, while selection of agricultural information providers was based on the information providers that were cited by the informants in Kirinyaga district and in Nairobi.

This study used multiple methods to capture qualitative and quantitative data comprising cross-sectional survey, interviews, questionnaires and focus group discussions to provide alternatives and flexibility. The survey method was used to assess people's feelings, thoughts, opinions and relationships. Interviews were conducted in both qualitative and quantitative approaches to provide the opportunity to clarify any outstanding issues, and obtain insights into the informants. Dervin's sense making interviewing technique was used for interviews and focus group discussions to gather in-depth data on agricultural actors, and to allow the farmers and representatives from other actors (key informants, research, training and education, CSOs and government departments) to deconstruct and describe their worlds in their own terms and meanings. Focus group interviews (Krueger and Casey 2000; Fern 2001; Bryman 2004) were held with groups. A semi-structured questionnaire was used to investigate agricultural information providers, and provided respondents the freedom to air and capture their own views (Sapsford and Jupp 2006:59).

The Rapid Appraisal of Agricultural Knowledge Systems (RAAKS), a soft systems methodology application provided for the inclusion of women and other frequently neglected groups such as the youth (Salomon and Engel 1997b). This study used a selection of RAAKS windows and participatory rural appraisal (PRA) methods. A semi-structured checklist was developed to guide observation of small-scale farmers and farmers' groups. Qualitative and quantitative data was analysed using SPSS (Carver and Nash 2009), NVivo (Richards 2006; Bazeley 2007) and through content analysis (Gray 2004:328). PRA and RAAKS data were analysed using diagrams, maps and tables. Details on methodology are presented in Chapter 4 and a summary in **Appendix 1**.

### 1.7 Delimitations, limitations and scope of the study

Creswell (2003a:142) argued that theory delimits the scope of a study and draws parameters around interpretation. Delimitations help to narrow the scope of a study to specific individuals or sites, while limitations identify potential weaknesses of the study (Creswell 2003a:148). Although the study examined the AKIS among small-scale farmers in Kenya, the study area was restricted to Kirinyaga district, Central Province, Kenya. This district was chosen because the area has high agricultural potential and high population, diverse agroecological conditions, varied climate, differing economic enterprises and has many farmers' groups. Farmers' groups and organisations were seen as a key focus of the study as they were formed in response to a "felt need" (Kimenye 1998:206; Place *et al.* 2004; Davis, K. E. 2006; ILEIA 2007:5). Furthermore, the district faces many social and economic challenges including small farm sizes, poverty, declining productivity in agriculture and livestock, poor communication networks, inadequate water supply and social problems such as gender inequality. More significantly, the farmers do not have good access to agricultural information and knowledge on production, post-harvesting and agroprocessing, markets and opportunities (RoK. Ministry of Finance and Planning 2002a). Because the AKISs of different communities are diverse and complex, the findings of this study cannot be generalised for all rural communities.

### 1.8 Outline of the thesis

The structuring of this thesis was informed by a number of authors (Mauch and Park 2003; Patton 2002:11,33-35; Creswell 2003; Dunleavy 2003; Sekaran 2003:338-351; Phillips and Pugh 2005; Blaxter, Hughes and Tight 2006; Gosling and Noordam 2006; Neuman 2006:473; Cohen, Manion and Morrison 2007; Creswell and Plano-Clark 2007; Teddlie and Tashakkori 2009; Wolcott 2009:29). The thesis is divided into three parts, which are described next.

**Chapters one to five** take the thesis up to the research methodology stage. Chapter one presents the background to the problem and rationale for the study, research problem statement, objectives and the research questions. The chapter also covers the assumptions of the study, the research approach, the delimitations, limitations and scope of the study.

**Chapter two** provides the context to research and focuses on the study area. This Chapter provides an overview of Kenya, its geographical and physical description, economy, agriculture and rural development, agricultural services, communication and ICTs, major development challenges, and agricultural policies, strategies and plans. The Chapter focuses on the agricultural sector in Kirinyaga district, Kenya.

**Chapter three** presents the main research paradigms, perspectives, theories, concepts, models and frameworks that provided the paradigmatic theoretical framework.

**Chapter four** positions the study by way of the literature review. It provides a landscape of studies conducted on AKIS highlighting global, African and Kenyan perspectives and the role that different

actors (especially small-scale farmers' groups) play in supporting agricultural development. The Chapter also reviews the literature on information behaviour of key agricultural actors, their sources of information and knowledge, linkages and flows of knowledge and information (including the role of ICTs), usage of these resources, barriers to accessing knowledge and information, existing practices in knowledge and information management. Chapter four also highlights AKIS models and other models for the transfer of agricultural knowledge and information.

**Chapter five** provides a description of the mixed or multiple methods research methodology with precise details on the procedures used in conducting the study and pertinent areas including population, sample, sampling techniques, the research design, description of instruments for data collection, measurement of variables and data analysis techniques. Finally, the Chapter discusses how reliability, validity and ethical issues were addressed.

**Chapters six to twelve** present results and interpret the empirical evidence on the socio-demographic characteristics of small-scale farmers and farmers' groups and the six research objectives and subsequent research questions. The Chapters convey the meaning of findings and provide linkages to other sections and components of the dissertation including the objectives, research questions, theoretical framework and existing literature.

**Chapter thirteen** culminates the dissertation and presents a summary of the results obtained, conclusions, evaluation of the methodology adopted by the study, limitations of the study, recommendations, originality of the study and contribution made by the study to the existing knowledge, policy and practice, and suggests areas for further research.

## **1.9 Summary**

This Chapter introduced the core subject area of AKIS and its role in increasing agricultural production. It discussed the background to the problem, presented the statement of the problem, objectives and the research questions. Many studies have been conducted on AKIS focusing on extension and innovation and these demonstrated that there was a need to improve linkages of key actors. In the context of Kenya, studies conducted on AKIS suggest the need for further research on small-scale farmer groups. The observations made by Jones (2006) are current and valid in addressing the crisis in African agriculture, in increasing agricultural growth to six times that which was achieved in the 1990s and in meeting the MDGs. AKIS has thus been a "hot" topic and an area of interest by not only international organisations such as FAO (FAO and The World Bank 2000) and The World Bank (2007a), but by regional, national and local institutions as well.



## **CHAPTER TWO: CONTEXT OF THE STUDY**

### **2.0 Introduction**

**Chapter two** presents an overview of the Republic of Kenya (RoK) with special reference to the agricultural sector, focusing on research, extension, education and information services and small-scale farmers and farmers' groups. The Chapter also highlights the major policies, strategies and plans that impact on the agricultural sector and briefly describes some AKIS initiatives in Kenya, while putting context to the research. Further, this Chapter describes the study area - Kirinyaga district in Central Province, and highlights the population, geographical and physical description, people, economy and communication, the major development challenges, development strategies and priorities.

### **2.1 Overview of Kenya**

This section provides an overview of Kenya with a bias to agriculture and rural development, the role of small-scale farmers and farmers' groups, agricultural services and the ICT landscape, major developments and challenges and agricultural policies, strategies and plans. The RoK is situated on the east coast of East Africa, and is bordered by the Indian Ocean on the southeast, Somalia on the east, Ethiopia on the north, Sudan on the northwest, Uganda on the west, Lake Victoria on the southwest and Tanzania on the south. Nairobi is the capital of Kenya. The country has the largest economy in East Africa and is associated with the East African Community (EAC) (UNECA and AU 2007:88). The RoK is ranked in the low human development category and is ranked number 147 globally out of 182 countries, with a 2007 human development index of 0.54 (UNDP 2009:173).

During the colonial era British and other European settlers established themselves as large-scale farmers in the Kenyan highlands (Meredith 2006:79), and as ranchers on the expanse of the savannah plains. The expansion of the British and European settlements was at the expense of the local people, who were by law not authorised to grow cash crops, hence were mainly subsistence farmers. There was a resurgence of demand for land and privileges and rights accorded to the settlers at the end of the Second World War in 1945. With time, the colonial government gave in to popular pressure and allowed the indigenous people to grow cash crops such as coffee, tea, pyrethrum and cotton and to keep dairy cattle on their smallholdings. Ultimately, Kenya attained independence on 12 December 1963, and became a republic in 1964.

The RoK occupies an area of about 587,000 square kilometres (RoK. Ministry of Agriculture and Ministry of Livestock and Fisheries Development 2004:5). Lying across the equator, the country has several diverse and complex geographic regions and a complex range of ecological conditions and varying climates. Kenya is divided into seven ecological zones ranging from the tropical alpine to the

coastal lowlands but only about 16% of the country falls in the high and medium agricultural potential zones. The rest (84%) is not suitable for rain-fed agriculture (RoK. Ministry of Agriculture and Ministry of Livestock and Fisheries Development 2004:5). The highlands around Mount Kenya (second highest mountain in Africa) are fertile, highly productive and support wildlife (CIA 2004). Administratively, Kenya is divided into eight provinces, which include Central, Coast, Eastern, Nairobi (area with provincial status), North Eastern, Nyanza, Rift Valley and Western provinces. These are further sub-divided into 69 districts (RoK. KNBS. Ministry of Planning and National Development 2007b:14; RoK. Ministry of Local Government 2009).

Kenya's population is estimated at 38.3 million (RoK. KNBS 2009:10) and is currently growing at 2.7% per annum (UNDP 2009:193; CIA 2010). The life expectancy rose from 53.6% in 2007 (UNDP 2009:173) to 57.9% in 2009 (CIA 2010). In 2000, 56% of the population were below 20 years of age (RoK. Ministry of Finance and Planning 2000:5). Kenya has people of diverse cultures and languages (RoK. Ministry of Agriculture 2006:vii). Most (97%) of the inhabitants are of African descent and fall into 40 ethnic groups.

The majority of Kenyans engage in farming and small-scale agriculture is predominantly practiced in the high potential areas (RoK 2002:3; RoK. Ministry of Agriculture 2006:6). The main crops grown in the highlands include coffee, tea, flowers, horticultural crops, maize and wheat and these are mainly grown on small farms, while crops in the lower areas include coconuts, pineapples, cashew nuts, cotton, sugarcane, sisal, and maize. The Savanna expanses and the semi-arid zones are used for rearing cattle, sheep and goats. Pigs and free-range poultry are also kept. The chief exports include coffee, tea, pyrethrum, and horticultural products (United States Department of State. Bureau of African Affairs 2007; RoK. National Development and Vision 2030 2008:64). After independence, the economy grew at an average gross domestic product (GDP) of 6% (RoK 1999:ix), while in the 1970s the economy grew at the rate of 7% (The World Bank 2004b:3). However, the economic performance fell dramatically between 1980 and 1990, to reach a low of 3.5% (UN 2001:5; RoK. Ministry of Livestock and Fisheries Development, Ministry of Cooperative Development and Marketing 2005:1). The performance degenerated further in the 1990s (Deutsche Gesellschaft für Technische Zusammenarbeit GmbH (GTZ) 2004:1; Nyoro, Ariga and Ngugi 2007:163) to 1.3% between 1990 and 2000 (RoK. Ministry of Livestock and Fisheries Development, Ministry of Cooperative Development and Marketing 2005:1; Nyoro, Ariga and Ngugi 2007:163). This poor economic performance led to the degeneration and near collapse of the country's infrastructure and weakened the institutions leading to a drop in living standards and deterioration in the quality of institutions (UN 2001:5; Gerdin 2002:12; The World Bank 2004b:vii,2,3; RoK. KNBS 2006). By comparison, this growth rate was way below the population growth rate. The economy had thus largely depended on external resources, which were poorly managed and targeted (RoK 2002:14).

From 2002, the Kenyan economy recovered in a number of key sectors. The NARC government which was committed to economic recovery developed the ERS and started implementing a reform programme in 2003 (RoK 2003; The World Bank 2004b:vii,2; RoK. KNBS. Ministry of Planning and National Development 2007b:7,13,93). The overall economic expansion increased from 0.6% in 2002, to 3% in 2003, 4.9% in 2004 and 6.9% in 2005 respectively (RoK. Ministry of Agriculture 2007a:1; RoK. National Development and Vision 2030 2008). While the real GDP at constant prices increased to 5.9% in 2005, it rose to 6.3% in 2006 and 7.1% in 2007 (RoK. KNBS 2009:10). However, the growth rate dropped to 1.7% in 2008 (RoK. KNBS 2009:10), following the December 2007 post-election crisis (RoK. National Development and Vision 2030 2008:3), the adverse climatic conditions, and the 2008 - 2009 increases in food prices (Cook 2009:2; Mukhebi, Mbogoh and Matungulu 2010:5-6). However, as pointed out in the ninth development plan, the economy needs to grow by more than 6.6% to achieve the targets set out in the National Poverty Eradication Plan (NPEP) of 1999 and a growth rate of more than 7% to achieve the goal set to attain industrial transformation by 2020 (RoK 2002:7). The ERS ended in December 2007, and was succeeded by the Vision 2030, which aims to increase the GDP to 7.9-9.7% per annum between 2009-2010, and to 10% by 2012 respectively (RoK. National Development and Vision 2030 2008:iii).

Kenya is the regional hub for trade, communication, travel and finance in the Eastern Africa region (CIA 2004). The country has the potential to become a service hub for adding value to regional products; referral, training and information services, as well as vertical integration (RoK. Ministry of Agriculture and Ministry of Livestock and Fisheries Development 2004:18). Several regional and international trade bodies have thus been established to improve market access. These include the Common Market for East and Southern Africa (COMESA), the EAC, the Inter-Governmental Authority on Development (IGAD), the African Growth and Opportunity Act (AGOA) and the World Trade Organisation (WTO) (RoK. Ministry of Finance and Planning 2002a:48-50).

Poverty, which includes “shortage of income and deprivation in other aspects, for example in knowledge ... and the standard and quality of life experienced” (RoK 1999:1,2) and poverty reduction is a priority activity in Kenya (RoK 1999:1,2). In facing up to the poverty challenge and in response to the call to “put people at the centre of development,” the government of Kenya became signatory to the World Summit for Social Development (WSSD). Among the goals of the WSSD is the eradication of poverty (RoK 1999:xi,1). Between 1980 and 2002, poverty levels in Kenya rose inversely to the declining economy and most social indicators dipped lower (The World Bank 2004b:5), while the food security situation worsened with the poor performance of the agricultural sector (RoK. Ministry of Finance and Planning 2002b:14). In his forward to the NPEP in 1991, the

former president of Kenya emphasised the importance of involving the poor (50 per cent of the population) and making them more productive (RoK. Office of the President 1999:ix).

Kenya has a unique “*harambee*”<sup>15</sup> movement that serves as a social inclusion and integration link of communities and individuals who were otherwise excluded from the development process (RoK. Office of the President 1999:6). A number of NGOs have demonstrated successes in financing small-scale commodity trading through women’s groups and through the “harambee” dogma, the government of Kenya was keen to support the formation of special purpose groups to bargain for better prices and market their farm produce collectively thus exploiting opportunities in the marketing chain (RoK. Office of the President 1999:69,70). Government departments and other actors including research and NGO partners have also adopted participatory approaches to farming system innovations and are working directly with poor farmers to set research priorities and test their own innovations, increase information about crop and livestock prices and marketing options through extension and rural radio (RoK. Office of the President 1999:83).

It is estimated that women produce more than 80% of the domestic food requirements in rural areas (RoK. Ministry of Agriculture and Rural Development 2001:21). However, as noted in the Poverty Reduction Strategy Paper (PRSP) (RoK. PRSP 2001), most rural women work as subsistence farmers and are among the very poor in Kenya. The higher poverty level among women has been attributed to the unequal power status of men and women and traditional roles (RoK 2004:10,57). Women handle a larger share of domestic and agricultural work and estimates suggest that women in rural areas work two hours longer than their male counterparts per day, and contribute significantly more to family farm income. Women are responsible for planting, weeding, cultivating and harvesting of food crops. Kenya is also signatory to the Convention on the Elimination of all Forms of Discrimination Against Women (CEDAW), which seeks to promote gender equality and provides a framework for women empowerment. However, gender inequalities in the agricultural sector continue to flourish and a baseline survey in 2006 on the level of awareness showed that most rural women were neither aware of their rights nor the existence of CEDAW (Federation of Women Lawyers (FIDA) 2006).

Although more than a quarter (26.2%) of rural households in Kenya are female-headed, the number of women who are involved in decision making and consultation is not proportional with the numbers that manage the farms (RoK 1999:64). Despite the fact that there are laws that provide for equal rights and privileges for both sexes, women are still disadvantaged (RoK. Ministry of Agriculture and Ministry of Livestock and Fisheries Development 2004:54). It was noted that

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<sup>15</sup> “Harambee” is a movement that operates on the doctrine of “let’s pull together.” The motto has supported the social structure through self-help initiatives in Kenya (RoK 1999:69,70; United States Department of State, Bureau of African Affairs 2007).

women's efforts are not recognised or accounted for at all levels (national and district). A number of authors (Curry, Kooijman and Recke 1998:6; Kimenye 1998:201; Kooijman and Mbaabu 1998:32; Ndubi 1998:111) have emphasised the need to treat gender issues differently, based on their communities and depending on their cultural background. Curry, Kooijman and Recke (1998) further argued that technology development and interventions required an understanding of gender issues. There is, therefore, a need for measures that ensure that the contribution of women in agricultural production is recognised and a need for different interventions for men and women. The failure to address gender issues has contributed to gender inequality and sidelining of women in land ownership, denial of bank loans for lack of land as collateral, and lack of control over land and its use (RoK. Ministry of Finance and Planning 2001:22; 2002:27; The World Bank 2009a:16). In 1995, KARI formed the Gender Task Force (GTF) to address gender issues in agricultural technology development and dissemination (Kooijman and Mbaabu 1998:25).

According to the World Development Report (2007), young people face challenges such as unemployment, lack of experience and lack of information but investing in the youth presents the world with an unprecedented opportunity to reduce poverty and accelerate growth (The World Bank 2006c:225,2). This is true of Kenya, where the migration of youth from rural to urban areas in search of employment has adversely affected the performance of the agricultural sector. A number of players including NGOs and government departments have developed strategies to arrest this movement by incorporating the youth into agricultural production and other rural based activities. Furthermore, the government has developed a youth development policy that outlines measures to reduce youth migration and sustain agricultural human resources (RoK. Ministry of Agriculture and Ministry of Livestock and Fisheries Development 2004:55) and the Environmental and Social Management Policy Framework that addresses youth unemployment and poverty issues (RoK 2010a).

The ICT sector in Kenya is described as dynamic and is one of the fastest growing in Africa. The government of Kenya recognises the importance of ICTs in improving performance of the productive sectors as the foundation of modern economic development, and ICTs have been identified as one of the key drivers in “transforming the country to a middle-income status by the year 2030 (Kagwe 2007). In this regard, Kenya has developed a draft ICT policy (Waema 2005), and Media Bill and Information Communication Bill (Wild 2006:7). One of the broad objectives of the ICT policy is the facilitation of the development of sectoral policies and strategies, for instance, e-agriculture (RoK. Ministry of Information and Communications 2006:10).

The ICT infrastructure has been greatly expanded and improved to provide communication linkages and information, thus improving the quality of life of Kenyans. E-government has been embraced

and public services and products can be accessed and delivered much faster and more efficiently. There are also e-learning and education initiatives, and tele-services that exploit skilled labour in the country. The government has further integrated ICT programmes in national development planning to exploit the opportunities accorded by the information age and ICTs are being used for efficient delivery of public services in all sectors (RoK 2002:20,107,108; 2004:43-44). The government of Kenya acknowledges that ICTs can provide access to information on weather, markets and farming best practices (RoK. Ministry of Finance and Planning 2001:67). The construction of The East African Marine Systems (TEAMS) under sea cable and domestic fiber optic cables is expected to benefit the Kenyan economy (Kagwe 2007; United States Department of State. Bureau of African Affairs 2007; RoK. National Development and Vision 2030 2008:27). Other submarine cable initiatives include the East African Submarine Cable System (EASSy) (Jensen 2006:3,7), FLAG and the initiative by a north American company SEACOM, which is working towards providing broad band facilities for high speed internet on the Eastern coast of Africa.

Another important initiative for Kenya is the World Bank supported Regional Information and Communication Technology Broadband network (RICTB). This regional initiative is working with the government of Kenya to develop ICT infrastructure and the initiative supports the “Digital Villages” initiative that will take ICTs to the rural areas for social and economic development. The initiative plans to set up e-centres to provide access points for services such as e-farming, e-learning and e-business among others (ICT Village 2007). The government plans to support the establishment of digital villages to facilitate delivery of services (RoK. National Development and Vision 2030 2008:27). The digital villages will provide e-mail, internet, e-banking, e-money transfer services and other business centre services (East African Correspondent 2008:31). There has also been phenomenal growth of Kenya’s cellular telephone sector and the subscriber base rose to more than 16 million subscribers in 2008 (International Telecommunication Union (ITU) 2009:15,58; CIA 2010). The country currently has four cellular phone service providers namely Safaricom, Zain (formerly Celtel), Yu (Econet Wireless) and Orange (Telkom Kenya and Orange France). Nevertheless, about 70% of the population lacks access to basic telecommunication services and there is a rural-urban digital divide (Kagwe 2007). Kenya had an internet penetration level of 8.7% in 2008, compared to the average of 4% for Africa and 23% globally (ITU 2009:6-7,60). The cellular phone is pervasive in rural areas and Kenya has a penetration of 42% (ITU 2009:15,58). As detailed in **section 4.7.3.2**, there were a number of innovative cellular phone applications for farmers (Mukhebi *et al.* 2007; Munyua 2007; Gakuru, Winters and Stepman 2009; Ochieng and Waema 2009).

The cellular phone had changed the way of life of most rural people in Kenya, with the development of innovative information and financial services and systems. While the information services are discussed in detail in **section 4.7.3.2**, one notable financial service is Safaricom’s M-Pesa service,

which links farmers and entrepreneurs and serves as a bank for the bankless. Farmers and entrepreneurs can use their cellular phone to transfer money electronically to pay for goods and services by using the short messaging system (SMS) and simply sending a text message. The phone thus acts as a bank account and a debit card (Munyua, Adera and Jensen 2009:5). A similar service named ZAP is offered by Zain – another cellular phone company in Kenya (Zain 2010). More recently, Safaricom in partnership with Equity Bank built upon the foundation of M-Pesa and launched *M-Kesho* - an innovative banking service that enables people to use their cellular phones to withdraw money from their accounts or deposit money into their accounts via the M-Pesa agents. *M-Kesho* targets those who do not have access to bank accounts (Opiyo 2010), to which most small-scale farmers belong.

## **2.2 Agriculture and rural development in Kenya**

This section provides a short overview of the agricultural landscape, performance and trends in Kenya, and highlights the importance of agriculture, the role of small-scale farmer groups and the significance of small-scale farmers' groups and farmer organisations in the agricultural sector. As reflected in the contribution to the GDP, agriculture is the largest productive sector and is considered crucial to social and economic development. Agriculture has been described as “a means of achieving equity and improving the welfare of the Kenyan population (RoK. Ministry of Agriculture 2006:1). Empirical evidence suggests a strong correlation between the performance of the agricultural sector and growth of GDP (RoK. Ministry of Agriculture 2006:vii; RoK. Ministry of Agriculture 2007a:2). In Kenya, land has been described as “a sentimental asset” and agriculture as a “means of livelihood” (RoK. Ministry of Agriculture 2006:vii). Agriculture also scores highly in employment creation, foreign exchange earnings as well as poverty reduction (RoK 2002:23; RoK. Ministry of Livestock and Fisheries Development, Ministry of Cooperative Development and Marketing 2005:1; The World Bank 2007b:9; 2007c:6). About 80% of the population reside in rural areas and rely heavily on farming for their livelihood (Mukhwana, Nyongesa and Ogemah 2005:7; RoK. KNBS. Ministry of Planning and National Development 2007a:13). Furthermore, the agricultural sector is considered the entry point for industrialisation in Kenya in terms of providing food, raw materials to the manufacturing sector, social security for industries and stimulates indirect growth and employment.

According to available statistics, agriculture is the largest source of employment in Kenya (RoK 1999:63; RoK 2002:23). The sector employs more than 80% of Kenya's workforce and contributes 57% of national income (directly and indirectly) (RoK. Ministry of Finance and Planning 2001:39; RoK. Ministry of Agriculture 2006:1). Agriculture and related activities contribute over 50% (about 26% directly and 27% indirectly) of the GDP (RoK. Ministry of Agriculture and Ministry of Livestock and Fisheries Development 2004). Agriculture also helps the government to deliver

regional and international commitments such as the first MDG on poverty and hunger (RoK. Ministry of Agriculture 2006:2-3).

### **2.2.1 Small-scale farmers in Kenya**

As emphasised in Chapter one, agriculture in Kenya is predominantly small-scale with about 80% of the farmers being smallholders (Mukhwana, Nyongesa and Ogemah (2005:7), who account for about 75% (RoK. Ministry of Agriculture 2006:6). The average size of small-scale farms in Kenya was two acres (0.8 ha) (RoK. KNBS 2008b:342). Consequently, the smallholder sector was described as “the largest single employer of wage labour” (The World Bank 1975:35). In Kenya, the size of land holdings differ from region to region with the majority of people operating an average of two to three hectares per household (RoK. Ministry of Agriculture 2006:6). Large-scale farmers have land holdings that average 50 hectares and mainly grow cash crops such as tea, coffee, horticultural crops, maize and wheat, while others keep livestock. As noted by Nyoro, Ariga and Ngugi (2007:164), horticulture in Kenya has grown rapidly, and is considered a success story. Large-scale farmers use agricultural inputs including improved technologies, hence have higher yields than smallholders (RoK. Ministry of Agriculture and Ministry of Livestock and Fisheries Development 2004:6; RoK. Ministry of Agriculture 2006:6). Large scale farmers also enjoy economies of scale, attract large scale buyers, have bargaining and negotiating power, therefore they can attract better prices. On the other hand, small-scale farmers encounter poor market opportunities, high costs of inputs, high costs of energy, poor infrastructure, low agricultural productivity and attract low prices due to diseconomies of scale. In addition, small-scale farmers have poor storage facilities, transport infrastructure, lack investment capital and have poor access to market information (Mukhwana, Nyongesa and Ogemah 2005:7). As observed by Micheni and Gathama (1999:28), most farmers in the Kenyan highlands are resource poor and cannot afford farm inputs.

### **2.2.2 Farmer organisations in Kenya**

Kenya has a history of mobilising local populations to participate in development initiatives such as farmers’ participation in on-farm trials, research groups and committee meetings (Ndubi 1998:114; Davis 2004). Farmers’ organisations and groups play a central role in averting some of the challenges experienced by smallholders and empowering farmers by pooling them together. Cooperative societies, farmers unions, produce associations and CBOs and groups have been described as some of the best recognised channels for providing extension services, agricultural inputs and credit (RoK. Ministry of Agriculture and Rural Development 2001:41; RoK. Ministry of Agriculture and Ministry of Livestock and Fisheries Development 2004:63).

While cooperative societies centre on marketing services, institutions such as the Kenya National Farmers Union (KNFU) and the Kenya National Federation of Cooperatives (KNFC) focus on



advocacy (RoK. Ministry of Agriculture and Rural Development 2001:24). In addition, there is the Kenya Farmers Association (KFA), which focuses on the distribution of services and the Kenya Small-scale Farmers Association (KESSFA), which provides technical and marketing advisory services (RoK. Ministry of Agriculture and Rural Development 2001:41). The Kenya National Federation of Agricultural Producers (KENFAP), participates in location and district committees and national executive council meetings. Although these groups and organisations disseminate technologies and information in the agricultural sector, they face financial and management problems (RoK. Ministry of Agriculture and Ministry of Livestock and Fisheries Development 2004:63; Muyanga and Jayne 2006:19). The government has undertaken to address these challenges through facilitating the growth and development of the organisations and groups and involving them in policy making forums as well as programme planning and implementation (RoK. Ministry of Agriculture and Ministry of Livestock and Fisheries Development 2004:77).

It was observed that farmers' groups were increasingly being used to deliver extension messages and the approach was found to be important and cost-effective in reaching farmers (Kimenye 1998:206; Franzel, Wambugu and Tuwei 2003; Davis 2004:204). The advantages of small-scale farmers' groups were demonstrated by the Association for Better Land Husbandry (ABLH) project in Kenya that supported farmers to market their produce collectively and transformed the lives of farmers in Ndia division in Kirinyaga district. Likewise, the Sustainable Agriculture Centre for Research and Development (SACRED) supported women's groups in Western Kenya to grow and market organic vegetables which were exported and earned the women a good income (IIRR 1998). Research conducted in Kenya revealed that working with farmer research groups increased efficiency and effectiveness and increased farmers' participation in decision making (Rees *et al.* 1999a:6), and in technical innovation (Kamau 2007:217-218). Kamau's (2007) study established that the formation of farmer research groups promoted farmer ownership of the research group approaches to extension and learning from one another and to develop collective action. Furthermore, farmer research groups provided mechanisms for strong collaboration between researchers, extensionists and farmers (Mula *et al.* 1999:27; Kamau 2007:219). It is noteworthy that Kenyan farmers and especially women have formed groups in order to better access extension and advisory services and to overcome their agricultural problems collectively (Mutua-Kombo 2001; Davis 2004:132,179).

### **2.2.3 Performance of the agricultural sector**

In the 1960s and 70s Kenya recorded the "most impressive growth rate" in the agricultural sector, averaging 6% per annum. However, growth in the agricultural sector declined over the years and performance was way below its potential (RoK. Ministry of Agriculture and Ministry of Livestock and Fisheries Development 2004:15). The 1970s and early 1990s experienced drought periods (Campbell 1999:392,412), and the average growth rate dropped to 3.5% per annum between 1980 and

1990 and continued to deteriorate in the 1990s (RoK. Ministry of Agriculture and Ministry of Livestock and Fisheries Development 2004:15). A figure of 4.4% was recorded in 1996, 1.5% in 1999 and -2.4% in 2000 (RoK. Ministry of Livestock and Fisheries Development, Ministry of Cooperative Development and Marketing 2005:2; RoK. Ministry of Agriculture 2006:x,1).

There was some improvement and in 2003, and a growth rate of 2.7% was achieved. However, performance declined to 1.8% in 2004 due to poor performance of maize, coffee, and pyrethrum. Equally poor was the performance of food crops and the beef and dairy industry (Ministry of Agriculture and Ministry of Livestock and Fisheries Development 2004:15). In 2005, there was significant growth in the agricultural sector and the gross value added (GVA<sup>16</sup>) grew by 6.7% (RoK. Ministry of Agriculture 2006:x,2; but dropped to 4.4% in 2006, 2.3% in 2007 and dipped to -5.1% in 2008 (RoK. KNBS 2008a:5,144; 2009:14). The Ministry of Agriculture's strategic plan also indicated an increase in volume of food crops (RoK. Ministry of Agriculture 2006:6). However, there was a decline to 5.6% in 2006 due to drought (RoK. KNBS 2007:5,24,159).

In terms of the sectoral composition of the GDP, the agricultural sector contributes the largest share to the GDP, followed by public services and manufacturing. The GDP figures reflect a decline over the years, and the figures were 37% in the 1990s, 25% at the end of 2000 (RoK 2002:23; RoK. Ministry for Planning and National Development 2007), 27.2% in 2001 (RoK. Central Bureau of Statistics 2007:50), 25.2% in 2002 and 2003, 24.2 in 2004 (RoK. Ministry of Finance and Planning 2006; RoK. Central Bureau of Statistics 2007:50; RoK. KNBS 2007:28; RoK. Ministry of Agriculture 2007a:2), 23.8% in 2005, 23.4% in 2006, 21.6% in 2007, and 23.4% in 2008 (RoK. KNBS 2009:17) respectively. This downward trend was caused by poor rainfall distribution, low quality seeds and low use of agricultural inputs (RoK. Ministry of Planning and National Development 2006:xiii,7). However, favourable weather conditions, revival of some irrigation schemes and improved performance of the cereals, horticulture and dairy sub-sectors saw the GVA grow from 1.7 per cent in 2004 to 6.9 per cent in 2005 (RoK. Ministry of Finance and Planning 2006:4,139).

The agricultural sector plays a lead role in contributing towards food security (RoK. Ministry of Planning and National Development 2006:xiii). Linked to food security is poverty reduction, which has been a major goal since independence (RoK. KNBS. RoK. KNBS. Ministry of Planning and National Development 2007b:7). During the 1990s, poverty levels increased to hit 48.8% in 1990 (RoK 2004:9), 52% in 1997 (UN 2001:4; RoK. KNBS 2007:9) and 56% in 2000 (RoK 2002:vi; RoK. Ministry of Planning and National Development 2006:66). To address the high poverty levels, the

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<sup>16</sup> Gross value added (GVA) is a measure of the value of the goods and services in a given sector such as the agricultural sector. In economic sense, GVA is a measure of output minus consumption and is linked to GDP in the sense that  $GVA + \text{taxes on products} - \text{subsidies on products} = \text{GDP}$  (Organisation for Economic Co-operation and Development (OECD) 2010; Wikipedia 2010).

ninth national development plan (RoK 2002:13) emphasised the stimulation of growth in the agricultural sector and stabilisation of the production of food staples. Despite the potential for increased production, about 50% of Kenyans were food insecure in 2005 (RoK. Ministry of Livestock and Fisheries Development, Ministry of Cooperative Development and Marketing 2005:1).

Nevertheless, some positive progress has since been realised and the overall national absolute poverty dropped to 45.9% in 2005/2006 (RoK. KNBS 2007:9,254; RoK. Ministry of Agriculture 2007a:3). The Kenya Vision 2030 medium term plan projects this figure to drop from 46% to 28% by 2012 (RoK. National Development and Vision 2030 2008:ii,2). The figure for the hard core poor<sup>17</sup> dropped to 19.1% in 2005/2006 from 29.6% in 1997 (RoK. KNBS. Ministry of Planning and National Development 2007a:9,254; 2007b 43). The national food poverty incidence figure declined from 48.3% in 1997, to 45.8% in 2005/06. The rural food poverty for Kenya declined from 50.7% to 47.2% during the same period, with Central province having the lowest level of 31.4%. About 49.1% of the rural population falls below the absolute poverty line with Central province scoring the lowest (30.4%), while the rural hard core poverty level was about 21.9% nation wide and 11.4% (lowest) in Central Kenya (RoK. KNBS. Ministry of Planning and National Development 2007b:9-10,43).

Like most developed and developing countries, Kenya has been working towards achieving the MDGs, and several projects have been initiated to speed up attainment of the MDG1 on poverty and hunger (RoK. Ministry of Agriculture 2007a:4). These include KAPP, which covers 20 districts and is funded by the World Bank; National Agricultural Extension Policy (NAEP) (RoK. Ministry of Agriculture and Rural Development 2001a); National Agricultural and Livestock Extension Programme (NALEP), which is supported by the Swedish International Development Agency (Sida) (RoK. Ministry of Agriculture and Rural Development 2001b); National Accelerated Agricultural Inputs Access Programme (NAAIAP), which provided “smart” subsidies<sup>18</sup> for vulnerable small-scale farmers to help reduce poverty (Kibaara *et al.* 2009:60; Kiome 2009:19); Horticulture and Traditional Food Crops Development Programme, which covers 8 districts in Eastern province and is funded by IFAD; Agricultural Sector Research under the KARI and agriculture research foundations funded by the European Commission (EC) and The World Bank; *Njaa Marufuku Kenya*<sup>19</sup>, which covers 71

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<sup>17</sup> Hard core poverty – a term used when the consumption levels of the individual would be inadequate to meet the basic food needs even if the individual were to forgo the non-food consumption and allocated their entire income to food expenditure alone. The hard core are the extreme poor, the poorest of the poor or chronic poor (RoK. Ministry of Finance and Planning 2002:25; RoK. KNBS, Ministry of Planning and National Development 2007b 10).

<sup>18</sup> “Smart” subsidy is a form of financial assistance by the government whereby small-scale farmers are given vouchers to obtain fertilisers from selected input providers in order to alleviate poverty and increase agricultural productivity.

<sup>19</sup> *Njaa Marufuku Kenya* – A Kiswahili slogan for the elimination of hunger in Kenya. *Njaa Marufuku Kenya* is a project funded by the Ministry of Agriculture and other partners to support farmers and alleviate poverty. The project provides training, information, and seed funds to farmers using the farmer group approach to spread new agricultural technologies and improved farming methods.

districts and is supported by the government of Kenya; Agricultural Sector Programme Support (ASPS), which covers 15 districts in Eastern and Coast provinces and is funded by the Danish International Development Assistance (Danida); Private Sector Development for Agriculture, which covers 9 districts and is funded by GTZ; Strengthening of Agricultural Training Centres, which is supported by the government of Kenya; Land Development and Machinery Services, which is supported by the government of Kenya; Rehabilitation of Agricultural Training Colleges, which is supported by the government of Kenya; Review of Agricultural Policy and Legal Framework, which is supported by the government of Kenya; Development of Community Agriculture in arid and semi arid lands (ASAL) and the PFI-FFS funded by the UNDP through the FAO.

These projects have contributed to improved productivity in different ecological zones in the country, including the arid, semi arid and the high potential zones, and have led to improved livelihoods. Most of the projects support farmers by providing training and seed money for introducing new technologies and adopting improved farming methods while others provide subsidies to farmers.

#### **2.2.4 Agricultural services**

This sub-section outlines the agricultural research services, the agricultural extension services, the agricultural information services, and the agricultural education and training services.

##### **2.2.4.1 Research services**

For a long time, agricultural research in Kenya largely concentrated on export crops (The World Bank 1975:459). Kenya has a good agricultural research infrastructure with more than 28 agencies engaged in agricultural research scattered in all agro-ecological zones. The pillars of research institutions include public-funded institutions, universities, international research organisations and commodity funded institutions (RoK. Ministry of Agriculture and Ministry of Livestock and Fisheries Development 2004:9-10; RoK. Ministry of Agriculture 2006:7). The lead agricultural research institute is KARI, which has the mandate for developing and disseminating agricultural technologies, knowledge and information to various stakeholders including small-scale farmers. KARI works through partnerships and linkages to ensure appropriate technologies are developed. KARI is a network of some 32 research centres located in different ecological zones and equipped with libraries and information centres (Rege 2006:217-218). KARI relies on funding from development partners and the Government of Kenya to support its research activities (RoK. Ministry of Agriculture and Ministry of Livestock and Fisheries Development 2004:31). As part of the on-going reforms, KARI launched the ATIRI in the year 2000. ATIRI works with partners to empower farmers to ensure that technologies developed by research reach their intended beneficiaries - the farmers, as well as ensure that technologies and information services are aligned to the needs of farmers. ATIRI plays a catalytic role in the dissemination process through working with CBOs and

farmer organisations to facilitate farmers – especially small-scale farmers to acquire appropriate technologies and information and provide training to farmers (Kamau, Kiome and Wamuongo 2000; KARI 2001; KARI. ATIRI 2007). Other major institutions include the Coffee Research Foundation (CRF), the Tea Research Foundation (TRF) the Kenya Marine and Fisheries Research Institute (KEMFRI) and the Kenya Trypanosomiasis Research Institute (KETRI).

Moreover, there are a number of international agricultural research centres that collaborate with national institutions (see **section 2.2.4.3**) and some smaller institutions that undertake research including agro-based private companies that have research departments (RoK. Ministry of Agriculture and Ministry of Livestock and Fisheries Development 2004:9-10). Nonetheless, despite the wide array of actors, agricultural research in Kenya suffers many challenges including limited research-extension-farmer linkages (RoK 2002:38; RoK. Ministry of Agriculture and Ministry of Livestock and Fisheries Development 2004:24).

#### **2.2.4.2 Extension services**

According to the Ministry of Agriculture and Rural Development, the role of extension is to “provide a two-way communication/training process involving adult learning techniques whose aim is to improve knowledge; change attitude/behaviour; lead to adoption of new technologies; and improve skills for both farmers and extension workers” (RoK. Ministry of Agriculture and Rural Development 2001a:7). The Ministry of Agriculture was primarily responsible for providing extension services country-wide at all levels. Following independence, the services worked well leading to growth of the agricultural sector. However, with the introduction of the structural adjustment programs (SAPs) and changes in the macro economic environment, the quality of extension services started deteriorating and became ineffective (RoK. Ministry of Agriculture and Rural Development 2001a:7; RoK. Ministry of Agriculture and Ministry of Livestock and Fisheries Development 2004:10). Among the contributors of the poor performance of the agricultural sector was the inefficient hierarchical linear government extension system, which was perceived to be top-down, a “public monopoly,” “supply driven,” and had inadequate participation by stakeholders (RoK. Ministry of Agriculture and Rural Development 2001b:1,5; RoK. Ministry of Livestock and Fisheries Development, Ministry of Cooperative Development and Marketing 2005).

It is widely acknowledged that public extension services in Kenya were inefficient (Kamau, Kiome and Wamuongo 2000:547; Muyanga and Jayne 2006:1). Indeed the government of Kenya noted that there was “no credible extension system and methodology in place” and what was there was described as “ineffective and inadequate.” Most farmers perceived the extension services to be “virtually dead.” Other challenges comprised inadequate knowledge, information and know-how on new technologies and improved farming practices, poor linkages with the research system, low

competency and quality of extension staff (RoK. Ministry of Agriculture and Ministry of Livestock and Fisheries Development 2004:10). The declining agricultural productivity, weak research-extension linkages, need for new approaches to technology development and recognition of farmers' expert knowledge acted as driving forces for the development of new extension approaches (Onduru *et al.* 2002).

Efforts to reform extension services saw a number of extension approaches and services being practiced in Kenya, driven by NGOs, CBOs, the private sector, commodity-based enterprises and consultancy groups (Kamau, Kiome and Wamuongo 2000:547; RoK. Ministry of Agriculture and Ministry of Livestock and Fisheries Development 2004:11). Some examples of the multiple extension players, models and approaches that have been tried out with varying success include the progressive or model farmer approach, the integrated agricultural rural development approach, farm management, training and visit (T&V<sup>20</sup>), attachment of officers to organisations, farming systems approaches, FFS and PFI-FFS (RoK. Ministry of Agriculture and Rural Development 2001:7; Muyanga and Jayne 2006:1). Other approaches used were individual farmers, group participatory approach, mass media and ad hoc approach (Chepsaigutt 1997:248). According to Onduru *et al.* (2002), FFSs were considered important in addressing linkages in agricultural technology development, weak research extension linkages, sharing farmers' expert knowledge and promoting the concept of 'learning by doing' and group dynamics. Onduru *et al.* (2002) posited that FFSs had spread in Kenya and were supported by the Ministry of Agriculture, KARI and NGOs, and had stimulated the horizontal flow of information among farmers.

In a bid to reform the extension services to make them more efficient, participatory and responsive to farmers' needs, the government of Kenya put in place the NAEP framework in 2001. The policy recognised the need for greater participation of the community and the private sector and demand-driven extension services (RoK. Ministry of Agriculture and Rural Development 2001a; RoK 2002:38; RoK. Ministry of Agriculture and Ministry of Livestock and Fisheries Development 2004:10). Despite the reforms, the NAEP operational framework was considered weak and the linkages with research institutional framework were insufficient (RoK. Ministry of Agriculture and Ministry of Livestock and Fisheries Development 2004:10). To respond to these challenges, the government developed the NALEP and its implementation framework (RoK. Ministry of Agriculture and Rural Development 2001b:1; Kiome 2009:21), which is largely funded by the Sida. NALEP is the main extension programme and covers 62 districts and uses the group approach (RoK. Ministry of Livestock and Fisheries Development, Ministry of Cooperative Development and Marketing 2005; 2007). The NALEP framework was formulated to support replication of successful approaches,

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<sup>20</sup> Under the training and visit (T&V) model, messages were passed to farmers through farm visits, farmer seminars or courses, field training, demonstrations and education tours (Chepsaigutt 1997:248).

involvement of major actors, participatory approaches, support value addition, address the needs of resource poor farmers, empower beneficiaries, and address the weak linkages between farmers, extensionists and researchers. NALEP also targets the innovativeness and enthusiasm of the youth in extension services, incorporates gender concerns and allows the integration of information on various development aspects including production, marketing and health. Further, the programme lays emphasis on adult learning and encourages ownership of problems and solutions by farmers (RoK. Ministry of Agriculture and Rural Development 2001b:5-6,21,23; RoK. Ministry of Agriculture and Ministry of Livestock and Fisheries Development 2007). For example, NALEP supports FFS and advocates for partnerships, the roles of NGOs, farmer organisations as well as other agricultural actors (Onduru *et al.* 2002).

More recently, the Ministry of Agriculture carried out a staff rationalisation exercise starting from 2005 with the aim of enhancing staff productivity and service delivery. Three hundred (300) additional extension officers were recruited and additional vehicles and motorcycles were acquired in a bid to improve extension services.

#### **2.2.4.3 Information services**

A study of the information landscape in the agricultural sector showed that the collection and dissemination of agricultural information is carried out by the private and public sector, international organisations, civil society and development partners (Maina 2000). Under the public sector, KARI has a directorate of information that provides agricultural information to researchers, extensionists, educationists and farmers. The Ministry of Agriculture and the Ministry of Livestock and Fisheries Development and other related government departments also have a section that offers information services focusing more on extensionists and farmers. The Kenya Agricultural Information Network (KAINet) has developed an e-repository of agricultural information on Kenya, which digitises and shares materials produced by selected national agricultural institutions in Kenya (Munyua 2006; CIARD 2008; KAINet 2009). Muyanga and Jayne (2006:6) emphasise that small-scale farmers require information on agricultural production, markets, value addition, and diversified income opportunities. Farmers need information to guide what to produce, what technology to use and where to market their produce (RoK. Ministry of Planning and National Development 2006:69). Conversely, it was observed that “messages delivered to farmers under the current system lack new or useful information” (RoK. Ministry of Agriculture and Ministry of Livestock and Fisheries Development 2004:10).

Farmers in Kenya obtain agricultural information through farm visits, farmer seminars or courses, field training, demonstrations and educational tours (Chepsaigutt 1997:248; Noordin *et al.* 2001:515; Davis 2004:130). Other sources cited were farmer-to-farmer visits and evaluation (Mulaa *et al.*

1999:26) and farmer field days (Njuguna, Oduor and Njenga 1999:69; Davis 2004:130; Kamau 2007:99). National and regional agricultural shows have been key sources of agricultural technology, knowledge and information over the years, while the Agricultural Information and Resource Centre (AIRC) provides timely and accurate access to relevant agricultural information (RoK. Ministry of Agriculture 2006:8-9). The content developed by the AIRC targets farmers and extensionists and is made available in English, Kiswahili and local languages as radio programmes, videos, manuals and booklets (RoK. Ministry of Agriculture and Ministry of Livestock and Fisheries Development 2007).

Various government ministries and departments are actively involved in managing agricultural information (Maina 2000:9). In addition to the activities carried out by the NALEP programme, which is currently implemented by the Ministry of Agriculture and the Ministry of Livestock Development (see **section 2.2.4.2**), the Programme launched the National Farmers Information Service (NAFIS) in 2008. NAFIS is a web-based telephony information service that is primarily voice based that provides extension information to farmers. Information is offered in English and Kiswahili via telephone or on the internet (RoK. NALEP 2008:34-35; Gakuru, Winters and Stepman 2009). In addition, some 1538 “Information desks” were established at provincial, district and local levels to improve the sharing of agricultural information between key actors (RoK. Ministry of Agriculture 2007a:11).

Although most agricultural information is in the public domain, private sector information services are becoming increasingly important as exemplified by initiatives such as the Kenya Agricultural Commodity Exchange (KACE) (Mukhebi *et al.* 2007:24-25), and private extension services (Umali and Schwartz 1994:30; Nyambo *et al.* 2009:100). In addition, Kenya has an abundance of NGOs whose mandates include farming. These include the Christian Community Services (CCS) which works with partners and farmers in adaptive research (GTZ Sustainet 2006), Plan International, CARE (Kenya), the Arid Lands Information Network-East Africa (ALIN-EA), the African Network for Health Knowledge Management and Communication (AfriAfya) Farm Africa and Catholic Relief Services (CRS).

There are also specialised private producer groups such as the Fresh Produce Exporters Association of Kenya (FPEAK), the Kenya Tea Development Agency (KTDA), and the Kenya Tea Grower Associations collect and manage agricultural information on commodities they specialise in that meets the needs of members. Other private sector players include agricultural input stockists and traders. There are also various community and Frequency Modulated (FM) radios that have developed local agricultural content in English, Kiswahili and local languages. International organisations and development partners have made a significant contribution in managing agricultural information (Ojiambo 1995:124-125; Maina 2000). Some of the notable organisations



include the ICIPE and CABI supply agricultural information (Maina 2000). Others are the International Livestock Research Institute (ILRI), International Potato Centre (CIP) and the World Agroforestry Centre (ICRAF). Among the development partners that manage agricultural information on projects or programmes that they support are the FAO, IFAD, DfID, Sida, the United States Agency for International Development (USAID), GTZ and the World Bank. For example, support from the World Bank will enable the Kenya Agricultural Productivity and Agribusiness Project (KAPAP) (RoK. KAPAP 2009:13) to work with 59 districts in Kenya to capture and document details on marginalised indigenous peoples of Kenya. Some knowledge of the Ogiek and Sengwer peoples has been documented.

#### **2.2.4.4 Education and training services**

Agricultural training in Kenya is offered at certificate, diploma, graduate and post graduate levels. Kenya has about 28 universities (accredited and unaccredited) (RoK. National Development and Vision 2030 2008:88). There are eight public universities and seven of them offer undergraduate and postgraduate degrees in agriculture and related sciences, along with one private university. Despite the growth in the number of universities, the facilities of these institutions have been under pressure due to the increasing number of students leaving high schools. To compound the situation, the agriculture, animal and fisheries resources curricula have not been adjusted to effectively meet the emerging farming environment in Kenya (RoK. Ministry of Agriculture and Ministry of Livestock and Fisheries Development 2004:11). In addition, the declining public sector employment opportunities that resulted from the freeze in public sector employment effected in 1999 resulted in fewer students applying for agriculture and animal and fisheries resources courses. It was observed that degree course enrolment for agriculture and livestock related courses declined by 6.2% between 2004 (5302) and 2005 (4972) respectively (RoK. Ministry of Finance and Planning 2006:151) and by 1.6% between 2005 and 2006 (RoK. KNBS. Ministry of Planning and National Development 2007a:9). There was also a gender imbalance and of the enrolled tertiary students only 22.8% were female as opposed to 72.2% male students in 2005. However, concerted efforts by the government and public sector institutions in 2006 saw the intake of female students rise to 31.2% (RoK. Ministry of Finance and Planning 2006:151).

As discussed above in **section 2.2.4.2**, the NAEF proposed the participation of farmers and other stakeholders as well as the demonstration of good agricultural practices at farmer training institutions (RoK. Ministry of Agriculture and Rural Development 2001a; RoK 2002:38). Agricultural training institutions in Kenya have also been encouraged to collaborate with relevant institutions to ensure that the training offered is demand driven and diversified towards addressing value addition. In Kenya, farmer level certificate and diploma training services are mainly provided under the Ministry of Agriculture and the Ministry of Livestock and Fisheries Development and in public funded tertiary

training colleges and farmers' training schools. There are eight tertiary colleges, most of which were run down and there are about 34 farmer training colleges or agricultural training centres. The government has been exploring the possibility of privatising some of the training centres so they can offer the required training. In the 1960s to 1980s, the training centres were the main points of interaction for small-scale farmers and were a major source of knowledge. Unfortunately, by 2004 most of these training centres were no longer fully functional and this has created a gap in training farmers (RoK. Ministry of Agriculture and the Ministry of Livestock and Fisheries Development 2004:11). Enrolment at training institutions and for vocational courses increased in 2005 but decreased in 2006 (RoK. KNBS. Ministry of Planning and National Development 2007a:174). The LLL initiative in Kenya (see **Chapter one**) is another example of networks that facilitated learning and such initiatives had empowered small-scale farmers to express their demands for service and seek their own solutions (Braun *et al.* 2007:19).

### **2.2.5 Major development challenges in the agricultural sector**

Although national development plans provide broad policy frameworks for addressing national development goals, these do not focus much on the needs of the poor and disadvantaged. The majority of the poor are located in rural areas and their livelihoods are dependent on subsistence crop and livestock farming, fishing and natural resource based small businesses (RoK 1999:9). As outlined briefly in Chapter one and in the sections above, the major development challenges pertaining to the agricultural sector include ineffective coordination of the various agencies that provide the requisite integrated services to small-scale farmers. Others included weak farmers' institutions and linkages, decreasing land sizes, inadequate use of improved technologies, unreliable rainfall and erratic weather patterns, over-reliance in rain fed agriculture, ineffective EWSs, inadequate research and dissemination of improved technological innovations and the lack of a land use policy (The World Bank 1975:459; RoK 2002:23,35). Weak and ineffective research-extension-farmer linkages are key barriers to attaining full agricultural potential (The World Bank 1975:459; RoK 2005a:2). In addition, government expenditure on agriculture is limited (The World Bank 2007b:18).

Other factors identified as hampering growth in the agricultural sector are increasing poverty levels, declining productivity, poor marketing infrastructure, limited access to credit, high cost of credit and farm inputs, poor infrastructure and unfavourable policy and legal frameworks (RoK 2002:11,19); an unfavourable macro-economic and external environment and inappropriate legal and regulatory framework (RoK. Ministry of Agriculture and Ministry of Livestock and Fisheries Development 2004:8,15); low usage of agricultural inputs (RoK. Ministry of Agriculture and Ministry of Livestock and Fisheries Development 2004:6); slow rate of adopting new high value crops and inadequate information frameworks and infrastructure (RoK. Ministry of Agriculture 2006:9,15); higher costs of production than neighbouring countries which puts Kenyan agricultural products at a disadvantage in

regional trade (Mukhwana, Nyongesa and Ogema 2005:7); the dilemma of not knowing how to synchronise production and market, hence when the season is good, the market is poor and prices are low and vice versa (Mukhwana, Nyongesa and Ogema 2005:8); poor access to agricultural information, low adoption of innovative technologies, inadequate storage and agroprocessing capacity, inappropriate land use practices, natural disasters such as droughts and floods, poor governance, declining soil fertility, pests and diseases, inadequate extension and advisory services and weak and ineffective institutional capacity, limited irrigation and inadequate legal and regulatory framework (RoK 2002; 2005:4; RoK. Ministry of Agriculture and Ministry of Livestock and Fisheries Development 2004:8,15; 2006; RoK. Ministry of Agriculture 2006:13-15; 2007:8-9).

### **2.2.6 Agricultural policies, strategies and plans**

The RoK is committed to improving the performance of the agricultural sector and has made a deliberate effort to provide an enabling policy environment and other supportive structures and legal frameworks (Alila and Atieno 2006). While some of the reforms undertaken over the years within and without the government have been good, others have not always been in the best interests of the agricultural sector. For example:

- The structural adjustment programs (SAPs) introduced by the World Bank in the 1980s led to the removal of price subsidies, price controls and brought about unregulated and haphazard liberalisation which culminated in increased costs of agricultural inputs, low usage of these inputs leading to lower production (RoK. Ministry of Agriculture 2006:vii).
- Since Kenya attained independence in 1963, it has had three long-term policies (Sessional Paper No. 10 of 1965: African socialism and its application to Kenya; the Sessional Paper no. 4 1981: National food policy and the Sessional Paper No. 1 1986: Economic management for renewed growth) and about nine five-year development plans to guide planning and investment. The Sessional Paper No. 10 noted regional and gender dimensions to the poverty problem (and other excluded groups) and worked towards mainstreaming these into development (RoK 1999:1,2). The paper also spelt out the priorities of alleviating poverty (RoK 2002:14).
- The District Focus for Rural Development (DFRD) strategy was formerly launched in March 1983. However, the target beneficiaries were inadvertently excluded from direct involvement in development activities, which led to very poor ownership of the strategy by beneficiaries and hence weak local support. Poor ownership compounded by low commitment culminated in the failure of the projects under the DFRD strategy (RoK 1999:6).
- In response to the WSSD summit, the government of Kenya formulated the NPEP, which provided a policy and framework for action against poverty. The NPEP recognised the important role and contribution of the poor in the development of the country and sought to achieve pro-poor service delivery to the poor and ultimately the growth of the economy. It laid emphasis on small-scale agriculture as well as rural small business and micro-enterprise, and growth in these

sub-sectors was expected to contribute to manufacturing and value addition of food and non-food agricultural and natural resources based products among others. The NPEP further sought to develop assets and income among the poor through group cooperation and support for new marketing initiatives (RoK 1999:xi-1).

- In 2001, the government of Kenya launched the PRSP and the action plan for implementation, which was the immediate predecessor of the NPEP (GTZ 2004:2). The objective of the strategy was to speed up economic growth and to reduce poverty (RoK. Ministry of Finance and Planning 2001:1). The PRSP considered agriculture and rural development to be the top priority in poverty reduction and set targets to reduce poverty from 56% in 2000 to 26% by 2010. Other areas identified were rural social capital, participation of all members of the community and improvement of agriculture (RoK. Ministry of Finance and Planning 2001; RoK. Ministry of Agriculture and Ministry of Livestock and Fisheries Development 2004:21,22).
- The Kenya Rural Development Strategy (KRDS) was launched in 2002 to address some of the challenges in the agricultural sector (RoK 2002:23; RoK. Ministry of Agriculture and Ministry of Livestock and Fisheries Development 2004:21).
- Kenya's 9<sup>th</sup> Development Plan (2002-2008) adopted a participatory approach to development and incorporated the roles of NGOs, CBOs, the private sector and religious organisations. Further, the government emphasised the empowerment of local communities in the implementation of programmes and projects (RoK 2002:22; 2005:4).
- The agricultural sector policy framework was later put in place to transform the agricultural sector and make it commercially oriented and profitable by providing appropriate policy, legal and institutional environment. It aimed to provide an environment that would be fair to all major stakeholders including farmers, producers, processors, marketers and provide efficient and appropriate advisory services for farmers, as well as technologies, knowledge and information (RoK. Ministry of Agriculture and Ministry of Livestock and Fisheries Development 2004:21-22).
- Despite the many policies and reform programmes, it was noted that growth in the agricultural sector remained elusive and poverty levels continued to increase. This necessitated re-engineering of government policies and programmes (RoK. Ministry of Agriculture 2006:2), and starting from 2003, the NARC government launched the Economic Recovery Strategy for Wealth and Employment Creation 2003-2007 (RoK. Ministry of Planning 2003), which in essence was in harmony with other existing policies. The agricultural related policies and reforms aimed at strengthening links between farmers and extensionists and researchers (The World Bank 2004b:2,10; Alila and Atieno 2006). The ERS provided a framework for reducing poverty and among other activities, increase the productivity of rural farm and non-farm endeavours with a focus on community-driven development (RoK. Ministry of Agriculture 2006:2).
- However, various government ministries noted the limited success with the ERS despite the challenges encountered while implementing the strategy and emphasised the need to revitalise

agriculture to promote growth and development in the country (RoK. Ministry of Agriculture 2006:2). There was a pressing need to reduce poverty levels and increase employment opportunities especially in the rural areas. In response to these identified needs the Ministry of Agriculture, Ministry of Livestock and Fisheries Development and the Ministry of Cooperative Development and Marketing formulated yet another strategy – “Strategy for Revitalisation of Agriculture” (SRA) 2004-2014 in 2004 (RoK. Ministry of Agriculture 2007a:1). Among the key elements of the SRA are promoting participatory approaches to development through empowering of local communities, facilitating private-public sector partnerships to encourage investment, increasing adoption of modern farming practices, improving markets and increasing competitiveness, and encouraging product diversification (RoK. Ministry of Agriculture and Ministry of Livestock and Fisheries Development 2004; RoK 2005a:2-4). To supplement the SRA the Ministry of Agriculture developed the Strategic Plan 2005-2009 (RoK. Ministry of Agriculture 2006).

- The Vision 2030 strategy, the successor of the ERS was launched in 2007 to drive the economic expansion of Kenya. This policy document identified the agricultural sector as being central to speeding up economic growth and attaining a GDP growth rate of 10% within 25 years (RoK. Ministry of Agriculture 2007a:1; RoK. National Development and Vision 2030 2008).
- The Ministry of Water and Irrigation launched the National Water Resources Management Strategy in 2008 and operationalised the Water Appeal Board, and instituted a decentralisation strategy in the water sector institutions to empower community members to play a more significant role in water affairs (RoK. KNBS 2008a:167).
- In addition, the Ministry of Agriculture carried out the following policies, legal and institutional reforms (RoK. Ministry of Agriculture 2007a:7-8):
  - the National Seed Industry Policy aims to make high quality seed and planting materials available to farmers, harmonising seed related activities and legislation. The draft policy amendments bill has been developed and is under review by stakeholders;
  - the National Agricultural Sector Extension Policy (NASEP) that aims to guide and regulate extension services in Kenya. The NASEP draft policy is ready and the implementation plan is being prepared;
  - the Amendment to the Coffee Act No. 9 that was added in 2001 to improve markets and marketing and the establishment of a Coffee Development Fund to support the coffee industry;
  - the Cotton Policy and Repeal of Cotton Industry Act Cap 335 aims to give new life to the cotton industry. The policy, which has been made law focuses on production, processing and marketing, among others;
  - The Ministry of Agriculture also developed the Agricultural Sector Development Strategy (ASPS) to help increase agricultural productivity by providing policy direction and encouraging public private partnerships (RoK 2010b);

- Other policies include the sessional paper of national food and nutrition policy (RoK 2007), the national nut crops and development policy (RoK. Ministry of Agriculture 2007b) and the national policy on horticulture industry development (RoK. Ministry of Agriculture 2007c);
- Goals and programmes of regional and international commitments such as the first MDG on poverty and hunger have also proved beneficial in guiding growth in the agricultural sector (RoK. Ministry of Agriculture 2006:2; RoK. Office of the President 2006; RoK. NESC 2007).

Most agricultural policies focus on increasing productivity, income and food security. However, the attainment of the national targets set in long term national and international development goals such as the Vision 2030, MDG1, and specific enterprises such as coffee and cotton need comprehensive programmes, strategies and plans as well as sufficient human, financial and information resources to ensure effective implementation at lower levels such as district level (RoK. KNBS 2008b:367).

### **2.2.7 Overview of agricultural knowledge and information systems (AKIS) in Kenya**

Chapter one and the profile of Kenya (**section 2.1**) presented a number of the strategic issues pertaining to AKIS, which are highlighted in the PRSP, the ninth development plan, the SRA, the Vision 2030 and the Ministry of Agriculture strategic plan among others. Small-scale farmers need agricultural knowledge and information to improve their farming. There is great diversity in agroecology, population, settlement patterns, poverty levels, agricultural enterprise and ICT infrastructure in Kenya and understanding the AKIS of a community would provide an holistic way of addressing the challenges and exploiting opportunities advanced. Andima *et al.* (1999:585) observed that direct and indirect efforts of various actors were required to influence adoption of agricultural innovation and increase production.

There are many efforts by the public sector, the private sector, CSOs (NGOs, CBOs, religious organisations, farmer organisations and farmers' groups) and regional and international organisations working towards addressing the challenges experienced in the agricultural sector as evidenced by the various policies, reforms and plans as well as the on-going initiatives. The different actors generate useful agricultural knowledge and information, and have diverse skills that need to be shared and disseminated. AKIS has therefore attained a place on the agenda of policymakers in the agricultural sector such as on the PEAP (RoK. Ministry of Agriculture and Rural Development 2001:2). A few AKIS studies have been conducted in different districts in Kenya to understand the roles, linkages among agricultural actors and the flow of agricultural knowledge and information as detailed in **section 4.6.3**. KARI and the Ministry of Agriculture carried out AKIS studies of four districts - Trans Nzoia, West Pokot (Rees *et al.* 1999a; Rees *et al.* 1999b), Kiambu and Homa Bay districts (Rees *et al.* 2000). These studies identified the key agricultural actors and activities linking their knowledge

systems, farming systems, the uptake pathways for agricultural technologies and communication networks to help improve the knowledge and information systems in the districts. Their coverage was, however limited and did not cover other districts in the country.

## **2.3 Profile of Kirinyaga district**

This study is based on small-scale farmers in Kirinyaga district, Central province, Kenya. This section introduces the study area and describes the administrative, physiographic and settlement patterns, the agricultural activities and major development challenges.

### **2.3.1 Administrative, physiographic and settlement patterns**

The study investigated the AKIS of Kirinyaga district, one of the seven districts in the Central Province. Covering an area of 1478 km<sup>2</sup>, Kirinyaga is the smallest district in the province. Kirinyaga is located between latitudes 050 and 00 400 south of the equator and longitudes 370 and 380 east, and borders with Embu district to the east, Mbeere district to the south and Nyeri and Muranga districts to the west. Kirinyaga has four administrative divisions namely Central, Gichugu, Mwea and Ndia. Mwea is the largest division (512.8 km<sup>2</sup>) and has five locations and 18 sub-locations, Ndia comes next (276.4 km<sup>2</sup>) with six locations and 24 sub-locations and is followed by Gichugu (229.7 km<sup>2</sup>) with six locations and 23 sub-locations. Central division is the smallest (108.5 km<sup>2</sup>) and has four locations and 15 sub-locations. These make four divisions, 21 locations, are further subdivided into 80 sub-locations<sup>21</sup>. The administrative units deal more with the executive arm of the government. These units are not homogeneous due to the diverse agroecological conditions, varied climate, differing economic enterprises and varying poverty levels. However, within a particular sub-location there is a fair degree of homogeneity (RoK. Ministry of Finance and Planning 2002a).

#### **2.3.1.1 Physiographic and natural conditions**

The district lies between an altitude of 6800 meters above sea level (masl) in the northern part and 1480 masl in the south. The upper parts of Ndia, Central and Gichugu divisions are in the highlands (4800- over 6800 masl) with fertile soils and enjoy tropical climate with heavier rainfall (two rain seasons). Mount Kenya, which is a volcanic mountain near the equator, lies in the north of Kirinyaga district. The midland area (2000-4800 masl) comprises the lower parts of Ndia, Central and Gichugu divisions, which share similar agroecological conditions. In contrast, the low land area in the southern part (most of Mwea) (1480-2000 masl) has gently rolling isolated hills and semi-arid conditions. There are many different soil types and soil fertility varies from rich fertile soils nearer the forest, where tea and dairy farming are the major occupations carried out by the smallholders to poorer soils in the lowlands (RoK. Ministry of Finance and Planning 2002a:6). The district also has a significant area of 350.7 km<sup>2</sup> under forest cover (Ministry of Finance and Planning 2002a:4). The

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<sup>21</sup> Although there is a new classification of sub-locations in Kirinyaga district, the present study is based on the number of locations and sub-locations outlined in the Kirinyaga district development plan of 2002-2008.

northern area (Gichugu, Ndia and parts of Central divisions) is endowed with rich fertile volcanic soils and is conducive for crop production. The area provides employment and income to most people in the district. In contrast, the lower zones have black cotton soils. Permanent streams from the melting snow flow down the slopes of Mount Kenya to the lower areas and the water is used for irrigation among other purposes. Rivers Rupingazi, Nyamidi, Thiba, Rwamuthambi and Ragati feed into Tana River and are used for irrigation, industrial and domestic activities (Ministry of Finance and Planning 2002a:6).

Kirinyaga District has a tropical climate, which is varied, considering the location near the equator and Mount Kenya and the Aberdare highlands. There are two rainy seasons – long rains averaging 710 mm, received between March and May, and short rains averaging 640 mm, which fall from October to November. In the cold season, temperatures drop to 5°C in the higher zones, while the lower zones experience high temperatures of up to 29 °C during the hot season. Evapo-transpiration increases as one moves from the highlands to the lowlands, resulting in lower crop yields in the lower zones (Ministry of Finance and Planning 2002a:7).

### **2.3.1.2 Settlement patterns**

Kirinyaga has a population of 475,105 of which 237,098 are males and 241,047 are females, giving a female: male ratio of 100:98, but there were more males than females in the age groups of 1-19 and 30-44 (RoK. Ministry of Finance and Planning 2002a:8). Of the total population, about 124,114 are youth aged between 15 and 25. The population density rose from 487 persons per km<sup>2</sup> in 1999 to 509 persons per km<sup>2</sup> in 2002 and was expected to rise to 541 and 557 persons per km<sup>2</sup> in 2006 and 2008 respectively. Of the 80% of land that is arable, 99% of is under agriculture. Kirinyaga district is classified as a high agricultural potential area and the population working under the agricultural sector is 187,955 (RoK. Ministry of Finance and Planning 2002a:4,8-11). Kirinyaga has urban type settlements around the municipal centres, but the rural periphery has evenly distributed settlement patterns. About 94.3% of the total area is rural while 5.7% is urban respectively. The district headquarters (Kerugoya) is in Central division, which is characterised by a high population and urban type of settlement due to the migration of people from rural to urban areas in search of employment and seeking business opportunities.

Kirinyaga district has about 114,439 households with an average household size of four persons. About 15,000 of these households are female-headed, while 578 are headed by children. The most densely populated area is Central division (714 persons per km<sup>2</sup>), followed by Gichugu (554 persons per km<sup>2</sup>) then Ndia (512 persons per km<sup>2</sup>). Mwea division in the lowlands is characterised by scattered homesteads with the rice growing schemes attracting high concentrations of villages, and the division has the lowest population density (257 persons per km<sup>2</sup>). Gichugu and Ndia divisions



share similar agro-ecological surroundings, and have evenly distributed settlements with scattered villages that were apportioned to the landless. The allotting of land to the landless has helped advance agricultural production and incomes in the district (RoK. Ministry of Finance and Planning 2002a:8).

Alleviating poverty is a challenge in the district and is most intense in Mwea division due to the prevailing semi-arid conditions land tenure system (landless tenants on rice schemes that were owned by National Irrigation Board (NIB). The main cause of poverty is attributed to unemployment and low agricultural productivity and low prices of agricultural produce. The high poverty levels have led to low access to social amenities, malnutrition, high rates of school dropouts and low levels of school enrolment. The situation is aggravated by informal settlers who occupy private and public land, and idle youth who have no land to cultivate, leading to poverty and the mushrooming of informal settlements. The absolute poverty in rural areas of Kirinyaga district is 49%, compared to 32.5% in urban areas.

#### **2.3.1.3 Agriculture in Kirinyaga district**

Agriculture is the main economic activity in the district, with 72% of the population engaged in agriculture while the rest are self employed, in wage employment, or unemployed (RoK. Ministry of Finance and Planning 2002a:8-9,25). However, the increasing size of the human population and the ensuing pressure on land has led to land fragmentation with the average farm size of small-scale farms being 1.25 ha (3.1 acres). Consequently, the district is characterised by many small-scale farmers who grow cash crops for local markets and export on about 35,711 ha and export and subsistence crops for household consumption and local market on about 50,450 ha (RoK. Ministry of Finance and Planning 2002a). Almost 90.6% and 92.9% of the poor and non-poor households in Kirinyaga district practice crop production (RoK. KNBS 2008b:347).

Kirinyaga district has a number of cooperatives including coffee, dairy and horticulture. Farmers have organised themselves into formal and informal groups to be able to access agricultural advisory services, training, markets and credit. Some farmers have adopted improved farming methods and there are several project-led activities in the area, including the adoption of high value crops and irrigation and a few ICT initiatives. As acknowledged in the 2002-2008 Kirinyaga district development plan, “Through the ICT sector, the farmers and those dealing with agricultural produce are able to access global market information” (RoK. Ministry of Finance and Planning 2002a:47). Many farmers’ groups exploit improved technologies and best practices (ICIPE 2005:98).

### **2.3.2 Major development challenges in Kirinyaga district**

Kirinyaga has a high level of population and faces many challenges including poverty and declining agricultural productivity. About 35.5% of the population is below the poverty line and 20.6% of the population was described as hard-core poor. Three poverty levels were identified namely the very poor, average poor and the well off (RoK. Ministry of Finance and Planning 2002a:25). The hard core poor are the poorest of the poor who cannot meet any non-food needs.

The main challenges affecting development of the agricultural sector in Kirinyaga district are similar to those identified for Kenya in general (see **section 2.2.5**). These include land fragmentation leading to uneconomical farm units, declining soil fertility, poor marketing channels, poor quality of seeds and inputs, usage of uncertified seeds, poor infrastructure and the need for improved farming technologies. In addition, the mismanagement of cooperatives including corruption, recurrent drought in the lowlands, high cost of inputs, and land tenure and settlement patterns affect the agricultural sector. The farmers in the district are also constrained by inaccessible or unaffordable credit facilities, inadequate agro-based facilities for value addition, poor prices and inadequate extension services that lead to declining productivity. Other challenges include poor communication networks, inadequate water supply, social problems and poor investment culture, gender inequality, land tenure and the youth having no land to cultivate, low incomes and unpredictable tropical climate. The farmers do not have good access to agricultural information and knowledge on production, post-harvesting and agroprocessing, markets and opportunities. According to the Kirinyaga district development plan for the period 2002-2008, ICTs have not been widely adopted in the district (RoK. Ministry of Finance and Planning 2002a:65-66). These combined challenges, poor national policies and local governance structures, poor infrastructure and the negative impact of HIV/AIDs have led to the collapse of sub-sectors such as coffee, rice, cotton, horticulture and dairy that were once very profitable in the district. Its agricultural potential, availability of farmers' groups, adoption of some improved technologies and diverse challenges made Kirinyaga district a good entry point for studying AKIS.

## **2.4 Summary**

Chapter two provided a brief introduction of Kenya and Kirinyaga district and the rationale for choosing Kirinyaga district as the study area. The Chapter presented the importance of agriculture and small-scale farming in social and economic development and the role of ICTs in agricultural development. This Chapter described the performance of the agricultural sector since independence and the major challenges that hamper the development of the sector. Also presented were the agricultural services in the country and an overview of AKIS in Kenya. Further, the Chapter highlighted the major policies and strategies in place for addressing agriculture and rural development as well as the value of the research.

# CHAPTER THREE: PARADIGMATIC AND THEORETICAL FRAMEWORK

## 3.0 Introduction

This Chapter presents the main paradigms and theories that provided the philosophical and theoretical foundation of the present study. As the objective of the present study was to investigate the different agricultural actors in Kirinyaga district, Kenya, and how they interact with each other, this study drew on a triangulation of paradigms, perspectives, theories, concepts, models and frameworks. The Constructivist paradigm (combined with Interpretivism and Naturalistic inquiry) and the Participatory paradigm provided the philosophical underpinnings that guided the study. The “Soft knowledge systems” approach and the “Systems thinking” approach (Checkland 1999; 2000; Wilson 2001), ensured an holistic perspective to understanding the social organisation of farmers, farmers’ groups, innovation and learning and the Knowledge management theory perspective provided a lens for studying the knowledge management component of the study. Further, the present study was guided by the Sense-making theory, Social cognitive theory / social learning theory, the concept of Social capital, CoPs, Wilson’s revised general model of information seeking behaviour, Meyer’s information merger model and the Cynefin framework.

## 3.1 Research paradigms

This section briefly reviews the different research types, and provides an overview of paradigms applicable to the study of AKIS and their implications for small-scale farmers.

### 3.1.1 Research

Research has been defined as “a diligent search for new knowledge,” and knowledge is a “set of beliefs about a specific segment of a reality or phenomena” (Mugenda and Mugenda 2003:197,199). Authors have broadly classified research by i) purpose - as being pure (also referred to as basic or fundamental or academic, and applied (Easterby-Smith, Thorpe and Lowe 2002:8; Neuman 2006:24; Durrheim 2006:44), as well as action research (Easterby-Smith, Thorpe and Lowe 2002:8) and evaluation and orientational research (Johnson and Christensen 2008:13). Research has also been distinguished by types namely ii) exploratory, descriptive and explanatory (Kumar 2005:9; Durrheim 2006:44) and as iii) quantitative, qualitative (Mugenda and Mugenda 2003:155-156; Durrheim 2006:44,47) and mixed methods (Johnson and Christensen 2008; Teddlie and Tashakkori 2009:3; Hesse-Biber 2010:3). iv) Mugenda and Mugenda (2003:160-175) further classified research by methods of analysis such as descriptive, causal, comparative and correlation, and v) by type of research covering survey, historical, observational and experimental research.

The objective of conducting pure research is to generate and advance basic knowledge about certain phenomena and deepen understanding of developments or processes of interest, and problems

occurring in society (Sekaran 2003:9; Leedy and Ormrod 2005:43; Durrheim 2006:45; Johnson and Christensen 2008:10). Pure research leads to the development of theory and the enhancing of understanding of commonly held views and problems occurring in our environment. This class of research provides additional knowledge such as discovery, invention and reflection, thus enhancing the theoretical conceptions on the researchers' topic of interest (Sekaran 2003:7,9; Leedy and Ormrod 2005:43). The knowledge acquired through pure research may later be applied to solve problems (Sekaran 2003:7,9). On the other hand, the objective of applied research is to solve an existing problem of immediate relevance to current problems, operations, routines and plans of action (Leedy and Ormrod 2005:43; Johnson and Christensen 2008:10; Gravetter and Forzano 2009:41). Applied research entails working with the stakeholders to apply results of findings and take immediate corrective action (Durrheim 2006:45; Johnson and Christensen 2008:11; Gravetter and Forzano 2009:41). Authors have observed a make-over of the "face" of research which has evolved over the years especially in the social sciences (Somekh and Lewin 2005:ix; Terre-Blanche and Durrheim 2006:10-11). New refined forms of applied non-experimental work and research have evolved to accommodate knowledge and social phenomena and are now being investigated in more creative ways that mix research methodologies. Greenwood and Levin (2008:70) argued therefore, that in social science, there is no divide between pure and applied research and contended that the world can be separated into "conventional social research" and "action research."

Action research provides a genuinely collaborative approach to defining a problem, solving problems, applying the solution and innovating, as it involves researchers and practitioners (Wilson and Streatfield 1982). Action research, also referred to as "teacher research" is widely accepted as a legitimate form of inquiry for doctoral degrees (Noffke 2002:13). It is an approach that contributes to current and practical concerns of people and the goals of solving a specific problem in a particular setting through collaborative approaches with the aim of leading to change (Easterby-Smith, Thorpe and Lowe 2002:9-10; Johnson and Christensen 2008:12). In differentiating between action and applied research, Leedy and Ormrod (2005:108) explained that action research is a type of applied research that aims at "finding a solution to a local problem in a local setting." Action research integrates research and action in an holistic manner, and yields knowledge and understanding that is broad and of a unique nature (Somekh 2006:6,7). As stated by Greenwood and Levin (2008:72), "only local stakeholders, with their years of experience in a particular situation, have sufficient information and knowledge about the situation to design effective social change processes." Indeed the goal of participatory action research (PAR) is to produce knowledge in partnership with "those affected by that knowledge" for the purpose of improving their welfare (Bhana 2006:430). PAR is becoming increasingly recognised as a valuable research approach.

Wilson and Streatfield (1982) applied action research in two information needs and information exchange projects. Other authors have applied action research to study AKIS (Engel 1995; Den Biggelaar and Mugo 1996; Boonekamp *et al.* 1996; Engel and Salomon 1997; Salomon and Engel 1997a; Ndungu, Nkonge and Rees 2000; Rees *et al.* 2000; Kennedy 2001; Best *et al.* 2005; Stefano *et al.* 2005a; Moussa 2006). The reflection on what type of research the researcher should adopt is determined by the goals of the research and the decision on what type to adopt calls for the re-examining of theory, technique or group of ideas (Easterby-Smith, Thorpe and Lowe 2002:9-10).

Action research focuses on the “insider” and both the researcher and the participants become researchers (Winter 2002:27), and is associated with the critical paradigm (UKZN. School of Education, Training and Development 2004:61). As already emphasised above, research evolution has been influenced by changing philosophical positions that provide frameworks for specifying the kind of enquiry, which are based on the purpose of the research (Wagenaar and Babbie 2001:19; Durrheim 2006:40). As the objective of the present study was to understand the AKIS of small-scale farmers and to generate new knowledge jointly with those who are affected and to advance the frontiers of knowledge, the present study was based on a mix of pure and action research.

While definitions of research are precise and unanimously accepted, Cheuk (2007a:2) pointed out that efforts to define knowledge and knowledge management have resulted in an abundance of literature and despite this large volume, there is a lack of a common understanding of the two concepts, leading to confusing and contradictory findings. This confusion is caused in part by the fact that authors have based their work on different research paradigms, assumptions and theories (Cheuk 2007a:2). As earlier emphasised by Lauriol (2006:36), the “positioning” or situating of the research within “a world of controversies, comprised of theoretical and epistemological stances” is important. In other words, the approach on which the study is based needs to be outlined, to guide the researchers’ “line of questioning.”

### **3.1.2 Paradigms**

The term paradigm is derived from the history of science and can be traced back to the work of Kuhn (1970:11), who defined a paradigm as a set of beliefs, rules and standards, procedures and practices that guide the world view of a group of researchers. A paradigm is a “scientific approach to some phenomena that provides model problems and solutions to a community of authors” (Rogers 1983:43). Hunt (1991) contended that paradigms and methodological foundations provide an alternative to contemporary social science. In related studies, Dooley, Johnson and Bush (1995:2) defined a paradigm as a set of assumptions from which subsequent theory is developed. Paradigms have also been referred to as “systematic set of beliefs together with their accompanying methods” (Lincoln and Guba 1985:15); “a basic set of beliefs, assumptions ... which serve as touchstones in

guiding ... activities” (Guba and Lincoln 1989:80); and as “frames of reference” in search of meaning while making different assumptions about the nature of social reality (Wagenaar and Babbie 2001:18). Bryman (2004:524; 2008b:14) described a paradigm as “a term deriving from the history of science, where it was used to describe a cluster of beliefs and dictates for scientists in a particular discipline that influence what should be done, and how results should be interpreted.” The term has also been used to describe how scientists in a particular discipline determine what should be studied, how it should be studied, how it should be done, and how the attained findings and meaning are assigned to them (Bryman 2004:524). In other words, paradigms are like lenses that help to view and focus phenomenon (Polit and Beck 2004:17). Thus, the different ways in which knowledge can be produced are distinguished by their different forms of assumptions, worldviews or paradigms (Terre-Blanche and Durrheim 2006:2; Creswell 2007:19). These authors concluded that paradigms define the nature of inquiry of a researcher in a tri-dimensional manner – ontology,<sup>22</sup> epistemology<sup>23</sup> and methodology<sup>24</sup> (see **Appendix 2**). According to Kuhn (1970:11), the “acquisition of a paradigm” is a sign of scientific maturity in a given field.

Firestone (1987:20) observed that there is a relationship between paradigm and methods and pointed out that the strength linking paradigms to methods was not very clear. There are different schools of thought about what we can know and what is real about the world, but the key assumptions of research paradigms guide a researcher on what methodology and methods to adopt (Bell (1987:4; Firestone 1987:20; Easterby-Smith, Thorpe and Lowe 2002:33). Paradigms also influence the manner in which we view research interests and guide decisions on what is worth studying, what is relevant and what methods to use (Dick 1993:53). As pointed out by Stilwell (2006:3), paradigms are important to understanding and contributing to the logic and harmony of employing qualitative and quantitative data in mixed methods studies.

It has been stressed that the choice of a particular paradigm guides a researcher on what methodology and methods to adopt, based on the assumptions of the philosophy to which they lend themselves (Bell (1987:4; Firestone 1987:20; Easterby-Smith, Thorpe and Lowe 2002:33). Research paradigms provide a framework that determines our approach to being in the world (Heron and Reason 1997). In emphasising the importance of research paradigms, Easterby-Smith, Thorpe and Lowe (2002:3,27) stated, “it is unwise to conduct research without an awareness of the philosophical ... issues that lie in the background” and reiterated that “Failure to think through philosophical issues ... can seriously

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<sup>22</sup> Ontology – outlines the assumptions made about the nature of reality to be studied or the knowable and what can be known about reality (Dick 1993:55; Easterby-Smith, Thorpe and Lowe 2002:31; Durrheim 2006:6).

<sup>23</sup> Epistemology – specifies the nature of knowledge or the nature of the relationship between the researcher and how knowledge can be acquired. It presents the general set of assumptions about the best ways of studying the nature of the world (Dick 1993:55; Snape and Spencer 2003:13; Durrheim 2006:6). Epistemology is also known as the philosophy of knowledge, and assumes a separation between knowing and being (Byrne 2001).

<sup>24</sup> Methodology – describes how researchers go about studying what they believe can be known in a practical manner (Durrheim 2006:6).

affect the quality of ... research.” Other authors have indicated that understanding philosophical positions helps to select and clarify the research design that will create new designs (Durrheim 2006:37,40; Cohen, Manion and Morrison 2007:78). Mugenda and Mugenda (2003:200) argued that reality is assumed to exist only as a possibility and reality can be discovered if researchers are able to describe the external world. It therefore follows, that paradigms legitimise the manner in which the research is conducted, and guide the researcher to what knowledge exists and how it can be known and comprehended. Paradigms guide the researcher on how knowledge can be conceived and analysed (critically) in order to discover essential features or meaning (Terre-Blanche and Durrheim 2006:2), and are “central to research design.” (Durrheim 2006:40).

A review of the social science literature identified several paradigms referred to by different names by different authors. Some of the terminology used for the concept paradigm was confusing and not consistent among authors with some using terms like “Scientific,” “Positivist,” “Constructivist,” “Naturalistic” “Interpretive” and “Phenomenology.” This varied terminology pointed to the need for clarity and a standardised terminology. Some authors referred to methodologies as paradigms, while others referred to methods as paradigms. However, traditionally, researchers studied the Positivism and Social constructionism (also referred to as Phenomenology) traditions as the main types of social research philosophies (Hunt 1991; Dick 1993:53; Easterby-Smith, Thorpe and Lowe 2002:28) (see **Appendix 2**). On the other hand, Gephart (1999) distinguished three prominent paradigms in social research namely Positivism, Phenomenological (Interpretivism) and critical Postmodernism, and pointed out that a Postpositivism philosophy was emerging. Byrne (2001) identified three qualitative perspectives namely Constructivism, Feminism and Interpretivism. Alternative paradigms that have been advanced include the Postpositivism, Social constructivism philosophical approach that is combined with Interpretivism, and Naturalistic inquiry, the Advocacy / Participatory perspectives and Pragmatism (Creswell 2003a:6; 2007:20), Interpretivism (UKZN. School of Education, Training and Development 2004:39; Terre-Blanche and Durrheim 2006:6), and the Critical realism paradigm (Wikgren 2005:11; Smith 2006). Creswell and Plano Clark (2007:22) distinguished four paradigms namely Postpositivism, Constructivism, Advocacy and Participatory and Pragmatism. Even though several new research paradigms have been advanced, Hoskisson *et al.* (1999:419) reminded readers that the newer ones have benefitted from the earlier ones. In short, the paradigm that a researcher adopts should be guided by the research purposes and objectives, and should provide a logical arrangement that is coherent with the research design (Durrheim 2006:38-39). The following section briefly examines the Social constructivist, Interpretive, Participatory and Relativist paradigms that were relevant to the study of AKIS, as well as the Pragmatic paradigm, which the present study adopted.

### **3.1.2.1 Social constructivism paradigm and phenomenology**

Röling and Wagemakers (1998:13) used the term constructionism to describe an epistemology that supports learning processes and guides the thinking around whole systems. Social constructionism was described as “one of a group of approaches that has been referred to as interpretive methods” (Habermas 1970 cited in Easterby-Smith, Thorpe and Lowe 2002:29). The aim of social constructionists is to seek to understand the social construction in the world of individuals (Gephart 1999; Creswell 2007:20), and investigate how objective features of society such as organisations (or farmers’ groups in the context of the present study) emerge, as well as how they are constituted by individual meanings that are subjective through processes such as group discussions. As pointed out by Sey (2006:529), the constructionist approach belongs to the postmodernist school of thought. Under social constructivism, individuals construct meaning socially through interactions or discussions based on their personal experiences and subjective views, hence the research yields complex and multiple meanings (Creswell 2007:20-21). Social constructivism is thus associated with qualitative approaches based on understanding phenomena (Creswell and Plano Clark 2007:22).

Supporting the view of Gephart (1999), Terre Blanche, Kelly and Durrheim (2006:277-279) added that social constructionist approaches attempt to examine the powers with which social images, signs, and meanings underlying actual or imagined experiences, create representations of people. Social constructionist methods are thus concerned with “power” and “meaning” – how “understandings or experiences of individuals or groups” are derived, and are qualitative and interpretive. Constructionist methods (referred to as critical hermeneutics by some people) assume that the thoughts, feelings and experiences of individuals are “products of meaning that exist at a social rather than an individual level.” Andrew (2004:1392) acknowledged the need for individuals to interact with the environment in order to operate in an effective manner and to survive. Language is thus considered crucial under social constructionism, and the approach assumes that human life is founded on language because language does not just point to objects but is the real object of study. In other words, language allows communication, which is the carrier of meaning (Terre Blanche, Kelly and Durrheim 2006:277-279,283). These authors pointed out that the Interpretive and Constructionist research paradigms tend to transform into each other and that there were no clear cut boundaries between the two paradigms.

Making a distinction between constructivism and constructionism, Talja, Touminen and Savolainen (2005:80) shared the view of Gergen (1999:59-60), who conceived constructionism to be the way in which the mind of an individual constructs reality in a systematic relationship with the environment. Here the emphasis is on conversations, and on the way the power of social structures influence the understandings of an individual and the world. For Holland (2006:92), social constructionism (in the context of information studies) referred to dialogue and discourses, which emphasise the role of



language in constructing reality. Dialogue and discourses were in fact considered to be essential elements in describing people's experiences in seeking, accessing, creating, using and sharing information. The general consensus of the community determines meaning, the idea that is intended and what is of use (Guba and Lincoln 2008:264). On the other hand, social constructivism refers to the mental process and conversions of knowledge (Holland 2006:92). Constructivism is a philosophical explanation that shows how learners create their own learning through discovery and verification. In other words, under constructionism, emphasis is placed on the learners' skills and the contexts in which they construct knowledge (Schunk 2008:236,516). Spender (2006:17) also concurred with Gergen's (1999) view point, and noted that constructivism concentrates on the internal mental processes, while constructionism "weights the processes external to individuals," for example language. Thus, the constructivist approach allows for the perspectives of the target group being studied to be addressed in-depth and by using their specific words to make known their meaning (Williamson 2006:98).

Constructivists are concerned with an interplay of knowledge that is subjective, objective and intersubjective (knowing the minds of others) (Gephart 1999). According to Gephart (1999), social sciences cannot be folded into natural sciences but rather individual people or groups make sense of the world around them through imposing patterns and relationships on social situations and sharing their experiences via communication. Gephart's (1999) view was supported by other authors, who argued that phenomenology (the constructivist approach) provides a deep understanding of human phenomenon or experiences encountered in everyday life and how meaning is constructed (Easterby-Smith, Thorpe and Lowe 2002:30; Patton 2002:104; Wilson 2002b). Expounding this further, Easterby-Smith, Thorpe and Lowe (2002:30) asserted, "human action arises from the sense that people make of different situations."

Constructivism is based on the ontological assumptions that reality is orderly, fixed or continuous, while the orderliness of human beings is centred on the consciousness within each person. Epistemologically, knowing is constructed by each person. Each individual is his or her own standard of judgement and personal authority provides the ideological bridge (Dervin 2003a:75,83). According to this assumption, each individual builds his / her understanding of the world by interacting with their own worlds (symbolic, social, natural, and physical) (Dervin 2003a:83-84).

Constructivists see the world as a "social construct" of society (Sheppard 2004:44-45). The constructivists' research designs assume reflexivity and conversation techniques for data collection. Social constructivists have argued that reality is a product of people's minds and is subjective (Sheppard 2004:44-45), and constructivist methods are qualitative and interpretive, and pertain to

meaning. Constructivists focus on language and assume that the human life world is constituted in language, which is the object of the study (Terre Blanche, Kelly and Durrheim (2006:275-279).

Social constructionism was developed in reaction to the disagreement among philosophers who held the view that social sciences consider reality to be socially constructed and given meaning by people (Easterby-Smith, Thorpe and Lowe 2002:29). Emphasis under social constructionism is on appreciating the person's experience of the world and the different constructions and meanings of the surrounding situation as opposed to objective and external factors. Focus is on what people – either individually or collectively are feeling, and thinking and how they communicate with each other (Easterby-Smith, Thorpe and Lowe 2002:30). The researcher, therefore, experiences the world with and through the action of others, making the experience inter-subjective (Patton 2002:104).

According to (Patton 2002:104), phenomenology might be the most significant philosophical crusade of the 20<sup>th</sup> century in social sciences. Leedy and Ormrod (2005:108,139), described phenomenology as an individual's perception of meaning of an event or the art of understanding the perceptions and perspectives of participants and views of social reality of specific situations. Terre Blanche, Kelly and Durrheim (2006:275,277) referred to phenomenology as the “principle of understanding in context,” meaning understanding the experiences of individuals in context (empathic perspective).

The strengths of the phenomenological philosophical approach include the ability of the paradigm to understand the meanings of people, focus on change processes of time and adjust to new issues. Further, it provides natural ways of gathering data (Easterby-Smith, Thorpe and Lowe 2002:32). The analysis of social constructivism focuses on sense-making that is driven by the desire to gain greater understanding of the inner knowledge and motivations of information users (Dervin 1999; 2005; Olsson 2003; 2005a; 2005b; Creswell 2007:21). Emphasising this point, Olsson (2005c) stated that the social constructivist approaches provide information researchers with a theoretical lens through which they can gain a clearer picture of information users as social beings and experts and not as “needy” individuals who need to be “helped.” Further, it was observed that phenomenology preserves its contextual integrity by focusing on the constructions of the individual being studied (Cohen, Manion and Morrison 2007:25).

One weakness of the constructivist paradigm is the cost in terms of time and resources required for gathering data. The second weakness has to do with the difficulties involved in the analysis and interpretation of data, while the third is that some people give low credibility to studies pursuing this approach (Easterby-Smith, Thorpe and Lowe 2002:32). The constructionist paradigm has also been criticised for not formulating explicit hypothesis, but rather, being guided by research questions. Furthermore, although the constructionist research is considered plausible, constructivist methods

can be complex and subjective (Easterby-Smith, Thorpe and Lowe 2002:39-40,42,54). As pointed out by Cooper and Schindler (2003:38), inductive research can be carried out through observation and interviews.

Information is conceived as being a social phenomenon (Wilson 2002a; 2003). He argued that the study of information requires social scientific research methods. Consequently, phenomenology has attracted a number of investigators, including Wilson (2002b) and Olsson (2003; 2005a), who applied the concept in studies on information behaviour. Wilson (2003) argued that phenomenology leads to a better understanding of meaning in social interaction, explores why individuals behave in the manner they do, and exposes emerging common patterns or understandings among the target group being studied. Wilson (2003) thus considered phenomenology to be a clear and coherent philosophy on which research findings on information behaviour can be grounded to advance knowledge.

Olsson (2003; 2005a) demonstrated the application of social constructivist theories such as Dervin's Sense-making theory and highlighted the constructions of meaning and social processes over time (as opposed to individual perceptions and reasoning). Olsson's (2003; 2005a) study concluded that individual participant constructions were rooted in their existing knowledge, beliefs and understandings, and that the individual's social contexts influenced the constructive process. This point was emphasised by Dervin (1999:730), who argued that "Sense-making mandates simultaneous attention to both the inner and outer worlds of human beings," and pointed out that it was not possible to separate the two. The present study adopted the social constructivist paradigm to address the information behaviour component of the present study.

### **3.1.2.2 Interpretive paradigm**

Snape and Spencer (2003:7) defined Interpretivism as the philosophy that focuses on interpretation and observation. The goal of the Interpretive paradigm is to interpret the actions of individuals (Diesing 1991:124; Cohen, Manion and Morrison 2007:21), expressions (Diesing 1991:124), and understanding of actions that are meaningful to people and shared experiences (Cohen, Manion and Morrison 2007:21). This paradigm aims to understand interpretations of the world by placing people in their social contexts (Hunt 1991:35; Gephart 1999). Further, Interpretivism seeks to understand the definitions of the situation of members as well as to examine how objective realities are produced (Gephart 1999). As such, it would appear that reality is mental and comprises peoples' perceptions (Hunt 1991:35). Gephart (1999) considered the criteria for assessing research to be trustworthiness and authenticity. Gephart (1999) argued that the search for patterns of meanings is the key focus of the paradigm. "Interpretivist constructivists" seek to show variation in meanings of individuals and differences in sense-making under objective realities (Gephart 1999). In other words, Interpretive constructivism offers ways to understand the theories of the world and the meanings of individuals.

Some authors have levelled criticisms against Interpretivism and have pointed out that methods in this paradigm do not use scientific procedures that are objective and focused on people's perceptions. Still, authors have argued that the interpretive philosophy ignores the power of external structural forces in shaping events and behaviour (Cohen, Manion and Morrison 2007:25-26). These authors also considered it risky to interpret the perceptions of an individual in a world "outside the participants' theatre of activity." However, Cohen, Manion and Morrison 2007:21-22) noted that under the Interpretive paradigm, theory is generated through collection of data that is grounded, and theory emerges from specific situations. Methods for data collection under the Interpretive paradigm include ethnography, participant observation, interviews, conversational analysis and case studies (Gephart 1999).

### **3.1.2.3 Participatory / Advocacy paradigm**

Heron and Reason (1997) pointed out that it is difficult to give an exhaustive account of reality using conceptual language under the Constructivist and Participatory paradigms. The participatory view of the world sees people as "part of the whole" and allows people to collaborate with others in conducting research (co-operative inquiry through experiential encounter). The Participatory paradigm does not impose conceptual labels on the minds of those participating in the inquiry hence they can shape their experiences based on what exists in reality. The Participatory paradigm places communities and people as part of their world, and calls for the need to be "situated," "reflexive" and "explicit" (Reason and Bradbury 2001:7). According to Creswell (2007:21), the participatory world view provides a "voice" for marginalised individuals and groups and factors in an agenda for action for change in improving the lives of the participating target group. The critical focus of the participatory world view is to change marginalised individuals for the better (Creswell and Plano Clark 2007:23). Critics have argued that the Participatory paradigm approaches are not reliable (Mosse 1994), and that they shy away from standardisation and quantification (Maxwell 1999).

### **3.1.2.4 The Relativist paradigm and Critical realism**

According to Myers (1997), critical researchers or relativists assume that social reality is historically constituted. This reality is produced and reproduced by people and focuses on oppositions, conflicts and contradictions in society. The goal of this paradigm is to uncover covered interests, expose contraction and facilitate more informed awareness (Gephart 1999). The Relativist school of thought argues that different observers may have different points of view emanating from different forms of mental constructions. The starting point of the Relativism epistemology is to express an opinion, which may be based on incomplete evidence (suppositions). The Relativist paradigm supports the use of multiple sources of data and perspectives, cross sectional designs and enables extrapolation of results beyond the study area (Easterby-Smith, Thorpe and Lowe 2002:42,45). Terre Blanche, Kelly

and Durrheim (2006:283) concurred with Easterby-Smith, Thorpe and Lowe (2002:42,45), and argued that all descriptions of reality were simply acts of informing and construction. Furthermore, relativists aim to understand and interpret the world based on its actors (Cohen, Manion and Morrison 2007:26). However, some weaknesses of the Relativist philosophy include some of the data collection methods used, particularly the survey techniques which may require large samples, which can be costly. Further, these methods may not explain why the patterns being observed are there. In addition, the multiple sources of data may be difficult to reconcile, especially where there are inconsistent and non-compatible sources, which may point to misleading conclusions (Easterby-Smith, Thorpe and Lowe 2002:42,45).

Some authors regard Critical realism as a variant of the Relativist paradigm, which recognises that social conditions (extreme conditions) such as power and political orientation have consequences and considers concepts to be human constructions (Easterby-Smith, Thorpe and Lowe 2002:32,33). Backing this recognition, Dobson (2002) stated that there is consensus among critical realists that the “knowledge of reality” cannot be understood without the involvement of social actors. Klein (2004:123,125) pointed out that although critical realism has been used in the study of information systems to address the integrated nature of information, researchers are divided over meanings of concepts such as knowledge and information and about the degree of rigor involved in the different methodological claims. Klein (2004:123,125) was of the opinion that adoption of the Relativist paradigm could advance knowledge that overcomes the negative effects of fragmentation of actors.

Critical realists emphasise explanation instead of prediction, and acknowledge, “knowledge is communicatively constructed” (Wikgren 2005:13). The Critical realism philosophy assumes that reality comprises different levels, which may be biological, social or cultural, and one level cannot be reduced to another level (Wikgren 2005:12). This assumption has implications for social phenomena such as information needs, seeking and use, which are complex and require multiple approaches. Earlier, Wilson (1986), pointed out that the nature of an individual’s everyday life in relation to work and in social interaction is important in determining the information needs of an individual or community served and in guiding the development of information systems. The Critical realism paradigm, therefore, provides a useful framework for studying information systems (Dobson 2002; Wikgren’s 2005:12).

Smith (2006) made a noteworthy contribution by suggesting an improvement upon the paradigms of Positivism and Interpretivism. Smith (2006) argued that information systems research conducted within Positivism and Interpretivism suffer from theory-practice inconsistencies. In addition, Smith (2006) pointed out that the Critical realist paradigm addresses the divide between Positivism and Interpretivism and allows for re-interpretation of phenomena and greater explanatory ability. This

ability makes the Critical realism paradigm suitable for investigating multidisciplinary studies with many levels such as user studies (information creation, seeking, use and processing) (Wikgren 2005:11). Critical realists support the idea of using abstraction, relying on interpretive forms of study and explanation (Wikgren 2005:12-14). In agreement with Dobson's (2002) view, Wikgren (2005:12-14) suggested that Critical realism is applicable in information behaviour studies. But although critical realism permits multiple ontologies such as the natural and the social worlds, it has been criticised for failing to reflect the limits and the relativity of the basis on which it is grounded (Klein 2004:130,140). Wikgren (2005:19) explained that an information seeker often takes a position in a given cultural situation and an already existing structure or system of sources of information and search possibilities.

Theories of the critical philosophical view take literary and narrative forms. The critical post-modern research investigates discourse at micro level and aims to deconstruct discussions to reveal hidden dichotomies such as gender and to reconstruct social arrangements that are less exploitative (Gephart 1999). The objective of critical realists is, therefore, to give an account of social behaviour through addressing inequality among individuals and groups (especially the disempowered) in an egalitarian society resulting in some form of change or transformation of society (Cohen, Manion and Morrison 2007:26). Critical social scientists base their arguments on critical theory and share the opinion that research traditions converge and are connected to particular social groups. This school of thought believes that research cannot be separated from issues of power (UKZN. School of Education, Training and Development 2004:45). Applicable research methods and types of analysis include field research, historic analysis and dialectical analysis. However, some critical research uses conventional positivist methods such as survey research (Gephart 1999). The present study adopted aspects of the relativist paradigm to provide a framework for studying agricultural information systems. The paradigm allowed for the use of cross-sectional design with multiple sources of data (including questionnaires and survey techniques), and the inclusion of perspectives of different actors in an holistic manner.

### **3.1.2.5 Pluralistic / Pragmatic paradigm**

Kuhn (1970:79,110) pointed out that there is no single paradigm that completely "resolves all its problems." Advocates of alternative philosophical views have suggested the use of pluralistic philosophies and methodologies and pointed out that research studies can use aspects of more than one paradigm to be consistent and coherent with the research question and to address the complexities of social science research (Dick 1993:54; Wilson 1981a; 1999; Dervin and Nilan 1986; Gephart 1999; Easterby-Smith, Thorpe and Lowe 2002:34,41; Greene and Caracelli 2003:95; Polit and Beck 2004:17; Denzin and Lincoln 2005a:189; Terre-Blanche and Durrheim 2006:9; Johnson and Christensen 2008:442). Stressing the use of multiple paradigms, Greene and Caracelli (2003:95,104) stated, "We reject both the continued search for the one best paradigm and the

assumed incommensurability of different paradigms as relics of a past era,” and pointed out that mixed paradigms allowed for the collection of data using multiple methods. Furthermore, in their study of mixed methods, Creswell *et al.* (2003:231) and Creswell and Plano Clark (2007:26) argued that there was no single paradigm, which could guide mixed methods research. On their part, Denzin and Lincoln (2005a:189) recommended “freedom from the confines of a single regime of truth” and asserted that there is no single conventional paradigm or “truth” because “all truths are partial and incomplete.” Creswell (2003:11) advocated for a pragmatic approach of linking the choice of paradigm to the purpose and nature of a study. Denzin and Lincoln (2008:29) pointed out that postmodernist scholars hold the thesis that “there is no clear window into the inner life of an individual” and that “no single method can grasp all the subtle variations in ongoing human experience.” Besides, McNiff and Whitehead (2006:39) pointed out that one paradigm may borrow from another, and at times it is not easy to tell where one starts and where the other ends. Adding to this debate, Durrheim (2006:40) stated that “all paradigms rest on untestable (metaphysical) assumptions, none can be incontrovertibly right” and researchers should ensure their results and conclusions are rooted in paradigms that use logical research designs. In other words, the Pluralistic paradigm that Creswell and Plano Clark (2007:23) referred to as Pragmatism paradigm leans towards “what works,” and more than one paradigm could be applied to a single study (Teddle and Tashakkori 2009:99).

Terre-Blanche and Durrheim (2006:7) advocated for an “intersubjective or interactional epistemological stance” towards the truth about reality and the use of methodologies such as interviewing and participant observation that support a subjective relationship between the researcher and those being studied. Cautioning on the mix of methods, however, Easterby-Smith, Thorpe and Lowe (2002:41) observed that advocates of pluralistic paradigms offered no advice regarding what to do when different sets of data contradicted each other.

Nevertheless, the present study adopted a combination of pure and action research to generate new knowledge. Further, the study adopted a dialectic stance, which assumed that multiple paradigms had a contribution to make, hence Pluralistic paradigms offered a greater understanding to the phenomena being studied (Teddle and Tashakkori 2003:22). In view of the contention by Rocco *et al.* (2003:27), that most past research did not discuss philosophical aspects that shape future research, this study triangulated various paradigms and perspectives to address different research questions with a view to providing understanding of the “worldviews” from different philosophical view points (Rocco *et al.* 2003:26). The “dialectic” stance which views each of the multiple paradigms as contributing to the greater understanding of phenomena and served as the foundation for combining multiple methods (Teddle and Tashakkori 2004:22). The study combined inductive and deductive approaches (Cooper and Schindler 2003:38). Inductive research was carried out through observation

and interviews. The research design was largely guided by the Social constructivist paradigm (combined with Interpretivism and Naturalistic inquiry), as well as the Participatory and the Relativist paradigms. The Social constructivist approach supported the learning process (Röling and Jiggins 1998; Röling and Wagemakers 1998:13) and helped the researcher to understand how the social world of small-scale farmers is constructed. Besides, as reaffirmed by Wilson (2006b:667), the study of information is multi-disciplinary and calls for the use of social research methods that focus on behavioural and organisational 'contexts' of information seeking from the perspective of the paradigm of social science. As concluded by Creswell and Plano Clark (2007:27), the best philosophical position for a study on mixed methods is the pragmatism or pluralistic paradigm.

On the one hand, the Naturalistic paradigm guided inquiry on studying information and information use (Dervin and Nilan 1986; Kirk 1997:257). Naturalists place emphasis on understanding the holistic as well as personalised aspects of human experience in natural settings and people are viewed in the totality of the elements of the environment (Lincoln and Guba 1985:37-40; Polit and Beck 2004:17). The Participatory paradigm (Heron and Reason 1997), helped the researcher to view people as "part of the whole" and allow for collaboration. The Interpretive paradigm (Snape and Spencer (2003:7; Cohen, Manion and Morrison 2007:21-22) helped the researcher to understand what was expressed or signified by the facts (Terre-Blanche and Durrheim 2006:9). The Relativist / Critical realism paradigm provided a lens for studying agricultural information systems in an holistic manner from the perspectives of different actors. The decision for the pluralistic approach or dialectic stance was informed by the strengths and weaknesses of the different philosophical positions discussed above, the broad, complex and multifaceted nature of the present study of small-scale farmers and other agricultural actors in rural development and the work carried out by earlier researchers such as Dervin and Nilan (1986) on the paradigm shift from system-centred user studies to person-centred user studies and Dervin (1989) on Sense-making theory.

### **3.2 Theoretical foundations - principal theories, models and frameworks**

There is a relationship between research paradigm, theory and research method (Firestone 1987:20; Easterby-Smith, Thorpe and Lowe 2002:27,31; Teddlie and Tashakkori 2003:22) and this relationship helps the researcher to take a more informed decision about the research approach, decide on appropriate methods for the research and think about constraints that may impinge on the study. This section presents the theoretical foundation on which the present study was based. Wagenaar and Babbie (2001:18,19) explained that while a paradigm provided a lens or way of looking at phenomena, theory aimed to explain what is observed. A theory provides logical explanation for what is observed in the world. As pointed out by Kuhn (1970:7,84-85), new paradigms and theories are revolutionary, and they do not just build on past ones, but reconstruct and re-evaluate prior facts. A theory is a statement that provides explanations of phenomena observed (Denzin 1978:72), and



discusses “how a phenomena operates and why it operates as it does” (Johnson and Christensen 2008:20). Thus, aligning philosophies, theories and methods helps to avoid confusion, ensure research objectives are achieved, and to provide an opportunity to discuss theory, methods and the research process (Knox 2004). For example, critical theory provides understanding of changes in society (UKZN. School of Education, Training and Development 2004:45), and while positivists hold the view that theory guides prediction, interpretivists see the role of theory as “describing the context for the production of meaningful experiences” (Wigren 2005:14). Furthermore, Mark and Snowden (2006) demonstrated that epistemologies are essential in avoiding distortion of research.

Another point pertains to the emphasis by Easterby-Smith, Thorpe and Lowe (2002:11), that it is a requirement of a researcher conducting a doctoral study to contribute to the theoretical foundations by looking at a practical problem from different theoretical perspectives. Creswell and Plano Clark (2007:21) also reiterated, “all research needs a foundation for its inquiry,” especially that of graduate students. Given that issues pertaining to the study of AKIS are complex and multifaceted, the present study was constructed upon a triangulation of paradigms, perspectives, theories, concepts, models and frameworks. As suggested by Mouton and Marais (1996:191), a review of social science research should describe at least one or more theoretical approach in a manner that integrates it with the logic of the research objectives. The theoretical framework for the present study included insights from the Soft systems, Systems thinking, and Soft knowledge systems approaches, Knowledge and information system perspective; Knowledge management theory perspective and CoPs; two theories namely Sense-making theory and Social cognitive theory; the concept of social capital; two models namely Wilson’s model and Meyer’s model; and one framework namely the Cynefin framework, which are discussed below along with other minor theories that have been used in the study of AKIS and information behaviour.

### **3.2.1 Perspectives and approaches**

The present study was guided by multiple perspectives and approaches comprising the systems approach, soft systems approach, knowledge systems perspective, knowledge and information systems perspective, CoPs and narrative approach.

#### **3.2.1.1 Systems and soft systems perspectives**

In addition to the pluralistic paradigm, the present study was informed by the soft systems perspective which facilitates social learning processes among different stakeholders and choice making (Checkland 1988; 1999; 2000; Röling 1988; Engel 1995; 1997; Engel and Salomon 1997; Salomon and Engel 1997a; Röling and Wagemakers 1998:16), along with the “systems perspective” (Röling 1988; Engel 1997:23; Senge 2006:7,42,73). In addition, the knowledge systems perspective (Röling

1988; 1989; Engel 1995; 1997:23), which is embedded in the soft systems approach provided understanding of the social organisation of innovation.

#### **3.2.1.1.1 Systems approach**

Checkland (1988:304-305,309) argued that the field of information systems lacks theory and has tacitly followed “systems thinking” to help bring conceptual clarity. According to Checkland (1988), the most fundamental idea with a systems approach is that the entity has “emergent properties,” which are only meaningful at “the level of the whole.” Engel (1997:24) described systems thinking as “an approach to studying the world and dealing with complex situations and intervening in it” and forms part of the Soft systems approach. Røling and Wagemakers (1998:16) recognised systems thinking as “a necessary holistic approach to complex issues.” This view was supported by Fisk, Hesterman and Thorburn (1998:218), who argued that community members do not exist in isolation, but rather, are enmeshed in the fabric of society and culture from which they come. As pointed out by Fisk, Hesterman and Thorburn (1998), solutions to complex social problems emerge from community members, and systems thinking helps to see wholes, recognise patterns, and interrelationships. Elsewhere, Wilson (2001) pointed out that approaches to systems development often failed to satisfy users’ problems because the problems were not understood or identified. Wilson (2001) argued that the secret to success lay in understanding the situation of the user.

According to Senge (2006:7,42,73), the “systems” perspective subscribes to looking beyond personalities and events. “Systems thinking” was thus a “conceptual framework” that lies in the shift of the mind, and entails seeing interrelationships between components, in place of linear cause-effect chains, and seeing processes of change as opposed to snapshots. Senge (2006) posited that systems thinking, starts with understanding the construct “feedback” and ultimately, a rich language for describing an orderly arrangement of interrelationships and patterns of change emerges. In other words, systems thinking reveals “wholes” and makes the full patterns clearer, where reality is viewed as being made up of circles as opposed to straight lines.

Checkland (1988:305,313-314) remarked that information systems had “neglected systems thinking as an underpinning to both its theoretical and practical concerns.” Checkland (1988) argued that information systems needed to follow the systems thinking approach, which offers an approach to tackling information provision problems in organisations. It has been observed that explicit and tacit knowledge of interacting individuals accumulates over time to form massive and complex systems (Gao, Li and Nakamori 2001:10,15-16). These systems hold the views of the big picture, and provide an holistic perspective of all stakeholders. As pointed out by Nakamori (2006:12), a system can be understood as a complex whole that includes human beings and information, but because it is not a reality, it is referred to as a soft system. Such systems are diverse and complex and vary depending

on the subject, but share a common philosophical background with Nonaka's *ba*<sup>25</sup> (Nonaka, Toyama and Konno 2000; Nonaka and Toyama 2005). Rivera, Qamar and Mwandemere (2005:12) observed that AKIS is rooted in systems theory and analysis. The systems perspective was considered suitable for studying AKIS, because it served as a lens for studying the isolated parts of the AKIS of small-scale farmers in Kirinyaga district, Kenya. The systems approach also formed part of the "soft systems" approach of the study.

### **3.2.1.1.2 Soft systems approach**

The soft systems approach facilitates social learning processes among different stakeholders and choice making (Röling 1988; Checkland and Scholes 1990; Salomon and Engel 1997a; Checkland 2000; Denzin and Lincoln 2005a:562; Senge 2006). The soft systems approach is founded on the works of Checkland (1988; 1999; 2000), on the basis that a group of activities are linked to form a purposeful whole ("meaningful only at the level of the whole") (Checkland 1988:309). Soft systems is described as an approach and a methodology (Checkland and Scholes 1990). The methodology has three objectives: i) to identify opportunities to improve a knowledge and information system, ii) to create awareness among relevant stakeholders, and iii) to identify actors and potential actors. Engel and Salomon (1997) distinguished between hard and soft systems thinkers. According to Engel and Salomon (1997), hard systems thinkers view the world as being systemic and focused on models that represent the real world, while soft systems (social constructivist) thinkers view the world as unsystemic, and images are developed to convey the different perspectives of social actors and their practices.

According to Engel and Salomon (1997), Checkland's soft systems methodology facilitates the design of useful interventions and its core concern is to ameliorate human practices. Soft systems were described as social constructs that are present to the extent that the people participating are in agreement regarding their goals, and negotiate the boundaries, membership and usefulness of the system (Röling and Wagemakers 1998:16,17). Further, they argued that this approach allows "a group of actors who are faced with a shared problem to engage in a collective learning process in order to design a human activity system that can help solve the problem through collective action." The soft systems approach is based on the systems concepts, which are consistent with complexity theory (Benbya and McKelvey 2006:16,17).

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<sup>25</sup> "*Ba*" is a Japanese word that means "place," that was understood as platform (shared place or space) for knowledge creation through emerging relationships, and knowledge is embedded in the *ba*. The space could be physical (dispersed business space, office), virtual (e-mail, teleconference) or mental (shared ideas and experiences) (Nonaka 1998:40). *Ba* was also equated to soft systems and was described as a combination of elements (infrastructure, actors information), characteristics (emergence, hierarchy, communication, control), and relationships (Nakamori 2006:12). The concept of *ba* provided a foundation on which to create knowledge that is developed individually and collectively, and combined physical, virtual and mental spaces (Nonaka and Konno 1998:40,41; Nonaka, Toyama and Konno 2000:16).

However, the soft systems approach has limitations. Critics of the soft systems approach have argued that the approach places too much emphasis on seeking harmony and consensus, and may not be useful in all situations (Engel 1997:28-29). It has also been argued that the available operational tools for exploring the relational dimensions of social interaction were inadequate and the emphasis on “wholeness” or “holistic” were considered challenging and ambitious. Nevertheless, the approach provides for wider participation and has been used to solve complex organisational problems, innovation, learning and choice making (Röling 1988; Checkland and Scholes 1990; Salomon and Engel 1997a; Röling and Wagemakers 1998:16; Checkland 1999; 2000; Denzin and Lincoln 2005a:562; Bawden 2006; Senge 2006). The soft systems approach helps with understanding innovation, and is used as a learning system (Checkland and Scholes 1990:27). For example, the AKIS has agricultural stakeholders who engage collectively to learn, address common problems and make joint discoveries. The social actors are linked together and the virtual system shows how they create, adapt, share, store and apply knowledge and information (Engel 1997; Salomon and Engel 1997a; Röling and Jiggins 1998:304).

Denzin and Lincoln (2005a:563) considered soft systems approaches to be anti-positivistic, and described soft systems as an approach where the researcher poses as a discussion partner or trainer to generate models of a situation. This approach provided a methodological approach (soft systems methodology) for solving complex organisational problems, and facilitating the integration of perspectives among key stakeholders (Röling 1988; Engel 1997:23; Engel and Salomon 1997), and a variety of analytical perspectives to study the interplay between agricultural actors, what they actually do, how they learn, how they share ideas and experiences and how they manage knowledge and information (Engel 1997; Engel and Salomon 1997; Salomon and Engel 1997a). Salomon and Engel (1997a) recommended the use of the Relaxed (or Rapid) Appraisal of Agricultural Knowledge Systems (RAAKS) (see **section 5.5.1.1**), which is based on soft (knowledge) systems thinking.

#### **3.2.1.1.3 Knowledge systems perspective**

The knowledge systems perspective, which is embedded in the soft systems approach, was used to guide the understanding of the social organisation of innovation. The knowledge systems perspective was developed by Röling and other colleagues at Wageningen Agricultural University (Röling 1988; Salomon and Engel 1997a). This perspective, which is embedded in the soft systems approach formed part of the theoretical framework that guided the understanding of the social organisation of innovation of the present study. The approach catered for the part of the study pertaining to the sharing of knowledge among key actors, and guided the integration of perspectives of key stakeholders (Röling 1988; 1989; Engel 1995; 1997:23). The knowledge perspective focuses on institutional actors and offers an holistic and inclusive character that stimulates discussion and learning among practitioners. It considers what people know and how they respond, and can take

research, education, mass communication and policy making perspectives into account. The knowledge systems perspective looks at agriculture as a social effort requiring competent interrelated actors and focuses on a diagnostic framework for analysis, design and management intervention (Röling 1988; Salomon and Engel 1997a). The heart of the knowledge systems perspective is grounded in the assumption that knowledge generated in one part of the system is transformed and utilised in other parts of the whole (Röling 1989:51).

Engel and Salomon (1997) advanced four major reasons for choosing systems thinking and the knowledge systems perspective to guide a study of the nature of AKIS. i) That this perspective offers potential for linking the macro and micro aspects of human actions at different levels, which requires a systems thinking approach that facilitates different qualities to emerge. ii) That the knowledge systems approach makes it possible to address multiple actors (such as extension, research, and education as well as mass communication) in the sharing of knowledge. iii) The knowledge systems perspective incorporates a comprehensive “human agency” view regarding what people know and what they do, as opposed to merely focusing on their roles as innovators or adopters or laggards (Rogers and Shoemaker 1971; Rogers 1983:22). iv) The knowledge systems perspective offers potential for studying innovation in agriculture from a social context focusing on interrelated actors. The present study considered the knowledge systems perspective suitable for the purpose of the study, where different actors worked together and depended on each another for innovation, decision making and problem solving. Engel and Salomon (1997) posited that the knowledge systems approach is underpinned by the assumption that knowledge is socially constructed and they recognised communication as a form of social interaction.

#### **3.2.1.1.4 Knowledge and information system perspective**

The knowledge and information system (KIS) perspective is the “KIS” component of the “AKIS,” and it centres on organisations and individuals, and the linkages and interactions among actors (Salomon and Engel 1997a:19). KIS is a virtual concept as opposed to a tangible “system.” Salomon and Engel (1997a) emphasised that the KIS is a way of thinking or “product of our imagination,” that helps us to better understand the social organisation of innovation in agriculture. Engel (1997:31) used the definition of KIS advanced by Röling (1992), who defined KIS as “the articulated set of actors, networks and organisations expected or managed to work synergically to support knowledge processes, which improve the correspondence between knowledge and environment, and the control provided through technology use in a given domain of human activity.” Unpacking this concept, Röling (1989:33) defined an information system as “a system in which agricultural information is generated, transformed, transferred, consolidated, received and fed back in such a manner that these processes function synergically to underpin knowledge utilisation by agricultural producers.” Röling (1989:33) defined an agricultural knowledge system as “a system of beliefs, cognitions, models,

theories, concepts and other products of the mind in which the vicarious experiences of a person or group with respect to agricultural production is accumulated.”

The KIS perspective falls under the framework of soft systems perspective and provides a diagnostic framework that brings to light organisational forms that facilitate knowledge and information processes (Salomon and Engel 1997a:19). Since all agricultural actors manage, generate, transform, transmit, integrate, disseminate and use knowledge and information to some extent, the KIS approach was adopted to provide a way of reviewing the interactions of actors in the light of stated objectives. This facilitated the design of effective communication and cooperation. The KIS perspective further provided opportunities for synergy in getting the stakeholders together, resulting in efforts that exceeded the sum of all the individuals.

### **3.2.1.2 Knowledge management theory perspective**

A study by Sveiby (1994) exploring ways of asking questions on the role of knowledge in organisations suggested a path towards a knowledge perspective. Sveiby (1997:xi,12-13) advised the adoption of a knowledge perspective that capitalises on intangible assets. Intangible assets are considered so valuable and it is feared that failure to manage them could lead organisations into disaster. These assets were classified into three families namely i) external structure, which pertained to relations between stakeholders and the organisation’s reputation or image; ii) internal structure, which included concepts, models and administrative systems that were created by individuals and were owned by the organisation; and iii) individual competence, which was based on education, experience and the capacity of the individuals to act in different situations to create tangible and intangible assets. Sveiby (1997) defined knowledge as “a capacity to act” (Sveiby 1997:37) and argued that knowledge is conjured up in people’s heads and that the human capacity to create knowledge is infinite. In a sense, the knowledge in AKIS and the knowledge in knowledge management are partially related. As pointed out by Rölöf (1988:32), knowledge is embedded in the minds of people and can be generated and utilised but not transferred as is the case with the different actors in an AKIS (that links people). This knowledge is largely tacit, and is a subset of the knowledge in knowledge management (see **sections 4.3 and 4.4**).

Sveiby (1997:10-11,22,28,30) pointed out that all individuals were voluntary members of organisations and argued that competence was owned by the persons who possessed it. Though this practical knowledge (for example about farming in the present study) is personal, it is formed in a social context and is mainly tacit. Besides, it has been asserted that knowledge and information grow when they are shared. According to Sveiby (1997), receivers give information meaning. The shared information and knowledge is then integrated with the experiences or mental models of individuals to determine how individuals make sense of it, and how they subsequently change and adapt. The

unique knowledge owned by individuals therefore needs to be shared with others for the benefit of the entire organisation. As pointed out by Nonaka and Takeuchi (1995:60), the mental models help people to become conscience of, and give definition to meaning in their world. Wiig (2004:xix) also pointed out that the blending of prior knowledge into new mental models was unique to individuals and the situations they were in.

Postmodernists acknowledge pluralistic approaches to the questioning of ideas, multiple understandings and in what we know of as the notion of progress, and recognise that there are inconsistencies, ambiguities, contradictions and ruptures (Styhre 2003:27). According to Dervin (2003a:85), postmodernism introduces the view of a “chaotic, decentred, unconscious human.” Knowledge is seen as a major production factor and a key organisational resource, which is linked to the notion of power. The knowledge management perspective lays emphasis on the intellectual, knowledge-based view of a firm, and has been used for studying how organisations create, distribute and use knowledge (Styhre 2003:144). In addition, Styhre (2003:25) described knowledge management as an oxymoron, meaning knowledge was processual and fluid, and hence while one part of the concept is moving, the other is fixed. Management seeks to control and to order. Knowledge management therefore, is “not a box of tools,” but rather, “a mindset” that provides organisations with a way of thinking about how to foster knowledge (Styhre 2003:80).

To use Styhre’s (2003:33-36) words, knowledge is “fluid and moving, embedded in social relationships, and emerges in practices and use of concepts.” Hence knowledge that is demonstrated through practice and concepts is not linear, moving from data and information to knowledge, and is neither a “thing” nor a “process” but rather a “fluid” that is the product between “seeing” and “saying,” which enables people to see and do things as well as say and write them. Knowledge management theory, which stems from interpretive and postmodernist approaches (see **section 3.1.2.2**) emphasises that knowledge is socially constructed (Engel 1997:14,32-33; Sveiby 1997:30; Røling and Wagemakers 1998; Styhre 2003:21). Knowledge management perspectives attempt to address aspects of knowledge that have in the past been neglected. However, the management of knowledge cannot be divorced from human faculties such as beliefs, culture and communication practices (Styhre 2003:149). It has, therefore, been stressed that the management of knowledge is complex and “knowledge must always be examined at its source ... the activities of the individual and communities of practice” (Styhre 2003:157). This assertion suggests that knowledge should be examined as a collection of skills, capacities and know-how in context. Knowledge management theory perspective was adopted in the present study to help understand and explain most of the processes that farmers and farmers’ groups in Kirinyaga district, Kenya used in capturing, recording, sharing and using local knowledge.

### **3.2.1.3 Communities of practice (CoPs) perspective**

A CoP is defined as a group “of people who share a concern, a set of problems, or a passion about a topic, and who deepen their knowledge and expertise in this area by interacting on an ongoing basis” (Wenger, McDermott and Snyder 2002:4-6). These authors described CoPs as an age-old practice in which the first knowledge-based social structures in the pre-historic times allowed people to meet around the fire to discuss livelihood strategies. People met together because they found value in their interactions and shared information, insight and advice, and discussed their situations, aspirations and needs. For Nilsen (2006:5), a CoP is “a learning space where both the tacit and explicit dimensions of knowledge are intertwined and developed further.” CoPs have many names and sizes and have been referred to as thematic groups or informal knowledge or learning networks (Wenger 1998), “micro communities of knowledge” (Von Krogh, Ichijo and Nonaka 2000), self governing groups of people who are held together by a shared interest, problem, job or practice (O’Hara, Alani and Shadbolt 2002:2-3), and learning communities (Sallis and Jones 2002:24; Wenger, McDermott and Snyder 2002:24,25).

According to Wenger, McDermott and Snyder (2002:42), CoPs refer to a specific social structure with the aim of creating, expanding and exchanging knowledge and to develop individual capabilities. As stated by Sallis and Jones (2002:24), “knowledge is often built up and generated by informal, self-organizing networks of practitioners.” The group members / groups learn together how to develop their competencies and how to do things easier and better, thus adding value to an organisation (O’Hara, Alani and Shadbolt 2002:2-3). However, learning requires an open atmosphere where each community develops a distinctive ambience in which members deepen relationships, establish norms and build a foundation for collective inquiry (Wenger 1998; Wenger, McDermott and Snyder 2002:37; Coakes and Clarke 2006). CoPs arise naturally and are an informal, relatively loose, distributed groups of people comprising members of a community (dynamic knowledge resources) who are closely knit because of what they do together (joint enterprise). CoPs are thus voluntary and organic (Wenger, McDermott and Snyder 2002:50), where members of a CoP define themselves in the doing of what they practice (Wenger 1998; O’Hara, Alani and Shadbolt 2002:1).

Wenger (1998) noted that CoPs are defined by knowledge as opposed to tasks, and participation is regarded as the medium that provides value to members. As emphasised by various authors, knowledge is recognised as “a key source of competitive advantage” (Wenger 1998), and a “key to success.” Internal leadership in a CoP is distributed, and the roles of leadership may be formal or informal. As knowledge is considered too valuable a resource to be left to chance, a CoP which connects people from different organisations and across business units, could knit the whole system around core knowledge requirements (Wenger, McDermott and Snyder 2002:6,36).



Emphasising the need to disseminate local knowledge, Choo (1998) explained that tacit knowledge could be shared with a group, which then modulates the personal knowledge through a network of roles and relationships or CoPs. Hence, knowledge needs to be created, accumulated, communicated and leveraged in practice (Wenger 1998; O'Hara, Alani and Shadbolt 2002:1). CoPs are pervasive, and weave whole systems around the most vital part of knowledge requirements by connecting people within and without groupings or organisations. The end product thus reflects the understanding of what the members conceive to be important (Wenger 1998; Wenger, McDermott and Snyder 2002:4,6). In other words, CoPs are self-organising, and require time and space for collaboration, where members interact regularly on issues that are considered vital to their domain (Wenger, McDermott and Snyder 2002:34). CoPs act as nodes for the exchange and interpretation of information and knowledge, act as temporary teams that provide a sense of identity and “steward competencies to keep the organization at the cutting edge” (Wenger 1998).

To Lave and Wenger (1991:50,122), learning through participation in CoPs concerns the “whole person acting in the world,” where learning takes place through continuously renewed sets of relations. They argued that knowing is inherent in the transformation of identities, and resides in relations among members (practitioners), their practice, artifacts and social organisation and political economy of CoPs. Wenger, McDermott and Snyder (2002:10-12) observed that social structure plays a key role for nurturing learning, developing competencies and managing knowledge, and the most useful knowledge bases were integrated into the work of one or more communities. CoPs provide a way of exploring situated learning within a given social practice domain, where individuals participating in a community of practitioners learn through participation and spread best practices (O'Hara, Alani and Shadbolt 2002:3). However, critics have argued that the sharing of best practices may work in the ordered system, but not in the chaotic domain described by Kurtz and Snowden (2003:479) and Snowden (2005:48) in the Cynefin framework (see **section 3.2.5**). According to Kurtz and Snowden (2003:479), the sharing of knowledge involves the provision of a set of rules or heuristic boundaries meant to increase the probability of problem solving, but individuals have the freedom to interact with other actors and come up with their own new ideas or patterns. Further, Snowden (2005:48) argued that at times it was not possible to anticipate an outcome, especially where levels of ambiguity were high. Benzie *et al.* (2005:180,181) reiterated that individual members carry out different tasks which add to the productive behaviour of the enterprise.

Still, Hildreth and Kimble (2002) emphasised that both hard and soft knowledge are created and shared in CoPs, but pointed out that soft knowledge cannot be easily learned by newcomers. Rather, soft knowledge is learned through “being socialised into the community” and interacting with members of that group. Furthermore, Wenger, McDermott and Snyder (2002:6) pointed out that

unlike assets which can be stored, owned and managed, useful knowledge is not a “thing” or an “object,” but resides in the skills, understanding and relationships of community members and in the tools, processes and documents they use, and argued that it is important to comprehend the challenges of managing knowledge. Wenger, McDermott and Snyder (2002) argued that knowledge is a living practice that results from accumulated experience comprising a residue of people’s actions, thinking and conversations. There are no clear beginnings and ends of knowledge communities, but rather, individuals come together and develop, evolve and finally disband.

Furthermore, authors have pointed out that the environment in which the learner engages in forms an integral part of the learning process and frames what is learned. CoPs therefore depend on who comprises the membership and determines their practices (Benzie *et al.* 2005:180,182). In other words, the process of participation depersonalises ideas and constructs group meaning. This perspective has been applied by a number of authors to study learning in communities (Lave and Wenger 1991; Wenger, McDermott and Snyder 2002; Small and Irvine 2006), in knowledge management and information behaviour (Davis 2005:106). The present study used CoPs, to understand learning and the social and institutional dimensions of small-scale farmers’ groups in Kirinyaga district, Kenya.

### **3.2.2 Principal theories**

Case (2002:134) observed that a number of authors confuse the overarching concept of paradigm with theory. Dervin (1999:729), who earlier observed this confusion, pointed out that some authors had used theory “loosely” to mean the outcome of their work, or that which guides their work (metatheorising). Kari (1998:2) clarified that while theories are less abstract and most changeable, metatheories are more abstract and least changeable, and pointed out that theories serve different purposes and operate at different levels. The *Merriam Webster’s Online Dictionary* defined a metatheory as “a theory concerned with the investigation, analysis, or description of a theory itself.” A metatheory is thus regarded as “the philosophy behind the theory,” and is related to the construct paradigm, but a paradigm is broader than a metatheory (Bates 2005:2). To Dervin (2005:25b), a metatheory was a theory that directs the process of observation or how to study phenomena, and was anchored to philosophical premises.

A theory is defined as a system comprising a set of interrelated constructs, concepts, definitions and generalised propositions that explain or predict phenomena, or explain facts by specifying relations among variables and laws that interrelate the constructs (Kerlinger 1985:9; Mugenda and Mugenda 2003:6,15). Theories are thus generalised explanations of relationships among phenomena and the key purpose of theory is to predict or to explain observed phenomena (Kerlinger 1985:9; Case 2002:135,153; Winter 2002:27), and constitute assumptions, principles and relationships (Bates

2005:2). Theories are abstractions representing descriptions of the empirical world, and are concerned with the how and why of empirical phenomena (Frankfort-Nachmias and Nachmias 1996:37; McKelvey 1999a:15). Dervin (2005b:25), described a substantive theory as a theory that results from observations.

Lewin (1936:4) asserted, “A science without a theory is blind because it lacks that element which alone is able to organize facts and give direction to research. It is necessary to have a theory ... which is empirical and not speculative.” This assertion suggested, “theory and facts must be closely related to each other.” Wilson (1994:17) asserted that failure to base research on theoretical frameworks was like “building a pyramid with no foundation,” while Mugenda and Mugenda (2003:6) stated that, “it is necessary for researchers to base their research studies on existing theories or known principles.” These assertions indicated that there is consensus that theory plays an important role in scientific research (Wilson 1994:17; McKelvey 1999a; Mugenda and Mugenda 2003:6; Wikgren 2005:12). Powell and Connaway (2004:30) asserted that theory is “the base from which subsequent stages of the scientific method flow.” McKelvey (1999a:15), however, noted that there is consensus among philosophers that “no theory ever attempts to represent or explain the full complexity of some phenomenon. The purposes of theory are to describe, predict, explain and control phenomena (Mugenda and Mugenda 2003:5-6). According to Mugenda and Mugenda (2003), scientific theories highlight commonalities or patterns in phenomena, and help to organise isolated findings from multiple studies thus ensuring consistency in different fields of study. Further, it has been argued, “the work of theory is to explain the hidden powers – processes or mechanisms that produce the effects or events that we study” (Wikgren 2005:12).

The principle theories upon which the present study was constructed were the Sense-making theory (Dwivedi 1997; Dervin 1998; 1999; Wilson 1999; 2000a; Spurgin 2006; Naumer, Fisher and Dervin 2008) and the Cognitive social theory (Bandura 1977; Smith 1999; Miwa 2005), and the concept of Social capital. As justified by various authors (Pretty 1994:38; Patton 2002:247; Creswell 2003:136), the present study considered the triangulation of theories necessary for ensuring the proper interpretations of the world, and for seeking objectivity because of the broad and multifaceted nature of the study.

### **3.2.2.1 Sense-making theory**

The principle theory adopted in the present study was the Sense-making theory. Sense-making incorporates the notion of life as an encounter with problems and knowledge gaps as earlier advanced by Dewey (1960), Kelly (1963:7-8) and Bruner (1990). Case (2002:147) pointed out that sense-making has its foundation in the learning theory of John Dewey, who emphasised problem solving through actions implemented in the real world. George Kelly’s theory of personality advocated that

an individual's behaviour was moulded by his/her mental constructs, which determined how an individual perceived the world. Jerome Bruner argued for the idea of assimilating findings to previous knowledge. Sense-making is both a theory of communication practice and a research methodology (Sense-Making), which emphasises solving problems through real actions (Dervin 1983; 1997; 1998:36; 1999:728; Dervin and anonymous students 1997; Wilson 1997a:41; Romanello, Dervin and Fortner 2003; Spurgin 2006:102). The Sense-making theory focuses on the triad – i) event of the situation, ii) a gap at the event, and iii) uses obtained from responses to the event's gaps (Dervin 1998; Tidline 2005:113,115; Foreman-Wernet and Dervin 2006:289; Naumer, Fisher and Dervin 2008). The Sense-Making methodology links the substantive theory to metatheory, hence provides direction on how to study observings and provides explanation on what is observed in information seeking by using communication processes (Dervin 2005b:26).

Sense-making is based on three main assumptions: i) that it is possible to design and implement communication systems and practices that respond to the needs of individuals, ii) that it is possible for people to enlarge their communication collections to pursue the vision, and iii) that achieving these outcomes calls for the development of communication-based methodological approaches (Dervin 2005b). The Sense-making theory sets out a general motivation for information seeking behaviour, and the main goal of sense making is to establish what users “really think, feel, want and dream” (Wilson 1997a:41; Dervin 1998:39). As pointed out by Wilson (1997a:41), stress<sup>26</sup> and coping<sup>27</sup> could be possible causes of motivation that necessitate sense making of the world. Sense-making is thus underpinned by the body of knowledge on the nature of human communication, and has replaced the ineffective models that were based on transmission metaphors (Dervin 1999:728).

Behavioural research for Dwivedi (1997:5) is “a systematic, controlled, empirical and critical investigation of hypothetical propositions about presumed relations among behavioural phenomena.” This suggests that phenomenological studies are not only ordered, but that the results obtained are scientific and seek to explain social phenomena. Dwivedi (1997:5) posited that behavioural research provides a mental picture of facts that are interrelated and form part of a larger system that links the past, present and future activities as well as aspirations, motives and attitudes of the subjects. Further, behavioural phenomena call for interpretation and analysis. Sense-making comprises a set of philosophical assumptions, propositions, methodological ramings and methods (Dervin 1999:728). As discussed in **section 5.1.5**, the Sense-making approach is grounded on the realist foundational

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<sup>26</sup> Stress was defined as “... a relationship between the person and the environment that is appraised by the person as taxing or exceeding his or her resources and as endangering his or her well-being” (Folkman 1984 cited in Wilson 1997b:554).

<sup>27</sup> Coping was defined as “... cognitive and behavioural effects to master, reduce or tolerate the internal and external demands that are created by stressful situations” (Folkman and Lazarus 1985 cited in Wilson 1997b:554).

definitions, constructivist learning theories and emphasises solving problems through real actions and verbings.

Dervin (1993; 1998:36) emphasised that the Sense-making metaphor uses different verbings (verbs as opposed to nouns) to reach the outcomes and effects. Dervin (1993) states that “we know a lot that we don’t know we know,” and communicating makes the micro become macro and vice versa. Further, the Sense-making theory is rooted in the metaphor of a person travelling through time and space from historical backgrounds with incomplete instruction and arriving at new situations facing gaps, building bridges across the gaps, and finally evaluating outcomes and moving on. The outcome depends on a person’s past, present and future (Dervin 1998:36,39; 1999:745; Spurgin 2006:102). The situation, gaps, bridges and outcomes across time and space metaphor focuses on the gap to make sense and directs researchers on how to think about people, how to talk to them, how to question them and how to design systems that meet their needs. Dervin (1998:39; 2006:6) posited that the metaphor forms the starting point for understanding users and their needs by addressing a situation, gaps and help. The idea of the gap addresses microlevel implementation of sense making in time and space and a free mind, leading to different forms of understanding of reality at that moment (Dervin 2003b:65-67,71). According to Dervin (1998:39; 2003b), the gap focuses on the “hows of communicating and on the situatedness of these hows.” Further, the metaphor forms the basis of the interpersonal interface between the user and the interviewer and questions pertaining to a specific micro-moment situation.

Information and knowledge according to Dervin (1998:40) are means to ends and not ends in themselves. Users should, therefore, be free to define what is “informing,” using their own terms or the reflection of their own mirrors. According to Dervin (1998:40), there is empirical evidence that suggests that users attend more to issues of cause, underlying connections and comparisons of different answers in different situations than traditional knowledge databases can account for. Sense making therefore focuses on human flexibilities and fluidities in addition to habits and rigidities. As the situational focuses change over time and space, knowledge creation, seeking and use also changes. According to Dervin (1998:40), Sense making uses the entire human body (body, mind, heart and soul) and emotions in determining the outcomes and sharing and cooperating with others. The Sense-making theory focuses on processes and dynamics of people, who are not only creative, but also changing and responsive. The people are empowered by personal action and the actions of others (Dervin 2003b:62-63).

For Spurgin (2006:102) each individual moves through space with other entities (people, artifacts, systems, institutions) hence time, space, movement, gap, step-taking, situation, bridge and outcome are central foundational concepts of the sense making methodology. He argued that users should

define what is “informing” using their own terms and methods, and researchers should focus on human flexibilities, fluidities, habits and rigidities. Like AKISs which are dynamic and complex, Sense-making attends to the potential of people to change across time and space. The unit of attention is the “person in situation” (the sense making instance) and can be applied in the context of knowledge management to design communication, knowledge and information systems, interactions in a community, public information products, interfaces between users and a system intermediary and entries for a knowledge base (Dervin 1998:41-44).

Through Sense-making interviews, respondents narrate how their actions, cognitions and feelings change along with their perceptions of reality. Thus, the Sense-making theory allows for the viewing of the internal process of an individual’s understanding, and helps inform communication where there are differences in decision making processes, handling of uncertainty and culture (Romanello, Dervin and Fortner 2003). These authors further argued that the Sense-making theory creates “moving pictures of the practices individuals use to negotiate their contexts or situation.” As stated by Dervin (2005b) the Sense-making theory is an approach to “thinking about” and implementing communication research that guides communication design and practice as well as communication based systems and activities. In addition, the Sense-making theory addresses sense making and unmaking (Dervin 2005b:26,28; 2006:5), and assumes that knowledge made today may be tomorrow’s gap (Dervin 1998:41; Spurgin 2006:102). In other words, gaps generate information needs alongside the expectations of respondents (Gluck 1997:54,55). For example, at times action steps are taken, and during the course of this action, the individual’s mind is changed through time and space, causing the step-taking to move into the unknown (Dervin 1998:41). Hence, in order to design responsive systems, it must be taken into consideration that, as humans move through time-space under dynamic conditions and in different situations, they must make and unmake sense. For this reason, Dervin’s Sense-making focuses on both sense making and sense unmaking (Dervin 2005b:26; 2006:5).

Dervin and Reinhard (2006) observed that the verbs of communication can be made to fit specific “communicative purposes” and pointed out that empirical evidence suggests three needs in the process of dialogue i) self understanding and thinking, ii) understanding and thinking about others and iii) sharing and promoting individual views and those of others. Dervin (1998:40-41) also pointed out the need to address power issues when applying the Sense-making theory because they can constrain human sense-making and how people share their knowledge with others. She argued that Sense-making permits users to provide information on power issues that would otherwise be missed out by surveys.

Sense-making has been criticised for its reliance on memory. Authors have demonstrated that Sense-making has a high degree of overlap of micro moment steps and that respondents may not recall aspects that happened in the past (Gluck 1997:56). To the contrary, Gluck (1997) then suggested that what one individual may forget is likely to be remembered by other respondents in the same situation. According to Gluck (1997:56), the micro moment steps have similarities with the time line triad method, which seeks commonalities through merging the individual time lines. Scholars have also observed some challenges to sense unmaking. These include the assumption that only one factual right answer applies to all situations, and forces of power in society and organisations force acceptance of prescribed answers. However, there are theories of how power works, how it is hidden in different activities, how it hinders sense making and sharing of their understandings (Dervin 1998:41). Kari (1998:1) contended that the Sense-making theory is not a theory but a metatheory. For Kari (1998), the Sense-making theory was fuzzy and had not been clearly and analytically expounded to the empirical level, and had in some cases caused misunderstandings and misusages. According to Kari (1998:1,16), the theory lacked “explicitness and development,” and was merely a “conceptual lens or point of view.” On the other hand, Naumer, Fisher and Dervin (2008) pointed out the weakness of oversimplification and shortcomings in terms of depth and breadth.

Despite these limitations, the Sense-making theory has been applied in different contexts including information behaviour and knowledge management (Dervin 1998; 2005a; Mehra, Bishop and Bazzell 2000; Cheuk 2007a; 2007b; Dervin and Reinhard 2006; Spurgin 2006) and communication practice and electronic communication (Dervin 2005a). In applying the Sense-making theory and methodology, Cheuk (2007b) stressed the need to make a safe place available and ensure anonymity to encourage people to talk freely and tell their stories. The research design of the present study relied heavily on Dervin’s Sense-making theory, to identify the information and knowledge needs of small-scale farmers in Kirinyaga district, their information seeking behaviour, where they obtain the information from, key actors, linkages and flows of knowledge and information between agricultural actors and use of ICTs for sharing and exchanging knowledge and information. The study investigated the usage of agricultural knowledge and information, and how agricultural innovation, best practices and knowledge (local and external) and information was captured and shared among key agricultural actors.

### **3.2.2.2 Social cognitive theory / Social learning theory**

The Social learning theory, which was developed by Bandura (1977), placed emphasis on participation and focused on learning as social participation. Bandura’s social learning theory was later renamed Social cognitive theory to emphasise the origins and actions of human behaviour, which are mainly social (Miwa 2005:54,56), and to capture the meaning of his theory which stretched

beyond how it was initially described - social learning to include motivation and behaviour, which was misleading because it linked to other similar theories (Bandura 2007).

The Social cognitive theory focuses on “observational learning” and aims to explain how people think through emphasising the importance of personal factors that affect people’s thoughts (self-efficacy) and behaviour on learning. It focuses on day-to-day human behaviour such as how people seek information. The Social cognitive theory aims to explain human behaviour in terms of continuous reciprocal interaction between personal factors such as knowledge, expectations and attitudes, and environmental determinants (Bandura 1977:vi,9-10). The manner in which individuals function is thus influenced by “personal, behavioural and environmental influences” (Mayer 2005:265). The theory focuses on cognitive factors. Bandura’s (2007) theory drew on the capability of symbols, the manner in which people understood the environment, what guided action, problem solving and how people gained new knowledge.

Bandura (1977:22) argued that learning would be hazardous and laborious if the actions of individuals were informed by only the effects of their own actions. Observation helps people to form ideas on new behaviour, which is coded and subsequently, this coded information determines the action taken. The action may be informed by seeing positive behaviour that is modelled and practiced by others within their environment (Bandura 1977; Smith 1999). In addition, the Social cognitive theory assumes that knowing is a matter of participating in active engagement with the world, and that learning through engagement with the world ultimately results in meaning (Smith 1999). Conditions necessary for the effective modeling of other people’s behaviour include paying attention to the other people’s models, the capacity to retain or remember the behaviour being observed, ability to recreate the model of the observed behaviour, and motivation to demonstrate the new behaviour (Bandura 1977). In sum, the Social cognitive theory allows people to “see” and build on the results of other people’s behaviour (Smith 1999).

According to Wenger (1998:12), the Social cognitive theory borrows from theories of practice, social structure, identity and situated experience, and is related to the Social theory of learning. Wenger (1998:12) explained that the key components considered necessary to characterise social participation as a process of knowing include i) meaning (learning as experience); ii) practice (learning as doing); iii) community (learning as belonging) and iv) identity (learning as becoming). The Social theory of learning thus assumes that people are social beings, and knowledge is a matter of competence. The functioning of a community is, therefore, held together through relationships of mutual engagement. This theory assumes that people learn through observing, and imitating the behaviour of others within the social context. The Social theory of learning has to do with learning through participation in their routine practices as social groups, how group members influence each other and how they



arrive at shared meanings (Mayer 2005:266). According to Wenger (1998), people learn by acquiring symbolic representations of the activities modelled on other's behaviour and attitudes. In other words, learning can occur by observing the outcomes of behaviour, where the observer is shaped by the actions of others, and the copying of new behaviour. Feedback and self corrective changes further reinforce behaviour. For example, small-scale farmers can learn a great deal by observing other members in their group or communities, and discussing the outcome of behaviour change can increase appropriate behaviour. Wenger (1998) points out that learning may occur without a change in behaviour. Empirical evidence provided in a survey by Akers *et al.* (1979:651) supported the Social learning theory on deviant behaviour.

Manz and Sims (1980:362) applied the Social cognitive theory in their study, which focused on the role of an individual in managing their own behaviour. Manz and Sims (1980) described self-management, which is a crucial element of this theory as "the process whereby a person is faced with immediate response alternatives involving different consequences and the person chooses an apparent low-probability response." According to Manz and Sims (1980:362-264), people exercise some degree of self control over their individual behaviours, and a leader can in some situations encourage members to take on self-management in order to achieve the organisational goals through modelling as suggested by Bandura (1977). The present study considered the Social cognitive theory to be invaluable to understanding the learning process amongst small-scale farmers through observing and imitating others and the social and institutional dimensions of farmers' groups. In addition, this theory helped the researcher to gain insight into information seeking behaviour and why some learning activities work in farming communities, while others do not work well and the factors that influence people's thoughts and behaviour on learning. The theory also guided understanding of how agricultural related skills are shared.

### **3.2.2.3 The concept of Social capital / Social capital theory**

The concept of Social capital was introduced into the social sciences by James Coleman, Pierre Bourdieu, and Robert Putman in the late 1980s and 1990s (Dekker and Uslaner 2001 xvii). Coleman (1988; 1994) addressed the public good character of social capital and focused on equitable power sharing among members to facilitate horizontal associations to generate social capital. Coleman (1988:s98-s104) pointed out that social capital has multiple entities, hence is defined by its function. Coleman's (1988:s111) work further illustrated the social capital derived from family relationships and showed that the human capital of parents influences their children. Coleman (1988:312) also drew attention to the potential of information acquired through relations with others, which provides the basis for action. Putnam's (2001) work in political science focused on civic engagement and regional differences in terms of involvement or volunteering, trust and participation. Social capital has been defined as the norms and networks that help people to act communally (Woolcock 1998;

2001; Woolcock and Narayan 2000:225), and as “networks and opportunities to mobilize resources” (Dekker and Uslaner 2001).

The construct of Social capital comprises trust within a social culture, social organisations, norms and sanctions, networks and information channels, and is related to the Social theory of learning (Coleman 1988;1994), as well as beliefs (mental or subjective knowledge), and rules (linguistic statements that express knowledge of values) (McElroy, Jorna and Van Engelen 2006:131). While trust was important, it was an outcome of social capital rather than part of the definition (Woolcock 1998:153; 2001:13; Putnam 2001:7). Other authors (Coleman 1994:306; Lyon 2000:663) adopted a broader definition, where trust formed part of the definition of social capital. Some scholars have referred to social capital as a concept (Woolcock 1998:162; Woolcock and Narayan 2000; Dekker and Uslaner 2001; Grootaert 2001:9; Woolcock 2001; Pretty 2003a:1,9,13) but others see it as a “theory” (Wenger (1998:3; Landry, Amara and Lamari 2001:79; Davis 2004).

Social capital involves the interaction of people and generating externalities or spillover effects (Collier 1998:2). Rose (1999:2) advanced the view that formal and informal networks that are linked can facilitate the movement of information between members, which could lead to positive effects. Elsewhere Gregory (1999:64) argued that social capital is self-generating and takes a long time to build. Gregory (1999) concluded that one key measure of social capital is membership in formal and informal groups and networks that foster social connections. In the same light, Kawachi (2000), asserted that social capital refers to features of social interactions “such as interpersonal trust, norms of reciprocity, and membership of civic organisations.” These features describe the collective resources of individuals through community network memberships that facilitate collective action and secure benefits (Kawachi 2000; Sobel 2002:139). Further, Woolcock and Narayan (2000:225) and Woolcock (2001:12) likened the construct to the saying “it’s not what you know, it’s who you know.” Social capital assumes that people are social beings and knowledge is a matter of competence with respect to valued enterprises (Davis 2003). Further, it regards knowing as an issue of participating and learning as bringing forth meaning in the world. Favell (1993:609) observed that the introduction of the welfare state to replace interdependent communal life has led to a decline in social capital because of breaking the old ties of kinship and extended families that assured moral order in society.

Social capital has been portrayed as a solution for social disintegration and division (Dekker and Uslaner 2001), and is viewed as an asset that can yield “a flow of benefits” (Grootaert and Van Bastelaer (2001:8). Contributing to this discussion, Grootaert (2001:10-14) observed that social capital integrates information sharing which is crucial in poverty alleviation, and coordination of activities to ensure equal sharing and efficient markets. Social capital further contributes to collective decision making, facilitates provision of public goods, and inculcates cooperative action. As noted by

Pretty (2008:180), trust was facilitated by cooperation, and collaboration between group members (Senge 2006:218). Grootaert (2001:10-14) stressed the need to combine social capital with other forms of capital to make them more efficient.

A study conducted by Landry, Amara and Lamari (2001:79) indicated that social capital varies greatly in terms of geographic area and professional activity. They posited that the theory of social capital is multifaceted and offers a new way to gain a competitive edge. Sobel (2002:139,150,152) argued that one could acquire social capital through purposeful actions of individuals in groups and posited that social interactions were dependent on the network structure and the available institutions. Pretty (2003a:1,9,13) postulated that social capital referred to the value of trust and connectedness among people, and argued that social capital lowers cost, brings forth joint action that is mutually beneficial, and contributes to the cohesiveness of individuals in their communities or societies. Woolcock (2001:72) and Pretty (2003a:1; 2003b:1913) distinguished three types of connectedness within and outside communities namely i) bonding, ii) bridging, and iii) linking types of social capital.

Social capital offers prospects for mobilising resources, thus enhances development (Woolcock and Narayan 2000:240,243). According to Grootaert (2001:10-14), social capital addresses associations that have a positive impact on development as well as groups that yield unsuitable results. Using the example of the Grameen Bank in Bangladesh, Grootaert (2001) illustrated how social capital helped to overcome poverty among the poor who previously lacked access to credit. In this context, social capital referred to the “resources gained in participating in relationship networks” (Landry, Amara and Lamari (2001:74). Onyx and Bullen (2001:45), observed, “Social capital is emerging as a crucial concept in the understanding of healthy groups and communities.” This observation was supported by Sobel (2002:139), who argued that individuals can use membership in groups and networks to secure benefits.

Social capital is evaluated in the context of knowledge of the society where the individual is situated, and access to resources through social capital is determined by the connections of individuals through common group membership. Social capital not only has implications for social fields, but knowledge management as well (McElroy, Jorna and Van Engelen 2006:124). For these scholars, most of what is described as social capital is some form of knowledge. Pretty and Wesseler (2004:3) considered social capital to be a prerequisite for improved agricultural production and argued that agricultural development benefitted from people who were in well organised groups that shared knowledge to increase their existing knowledge. As noted by Hoffman, Hoelscher and Sherif (2005:98), social capital can enhance knowledge management within an organisation, help to facilitate the development of collective intellectual capital and make collective action more efficient. According to

Hoffman, Hoelscher and Sherif (2005), intellectual capital depends on the combination of knowledge and experience of different groups. It can be concluded that social capital promotes spontaneous cooperation, coordination and collaboration for the good of a community, and is heavily dependent on culture (Dekker and Uslaner 2001:xvii,1).

Social capital provides a new way to gain a competitive edge, and varies greatly in terms of geographic area and professional activity (Landry, Amara and Lamari 2001:79). In the opinion of Clutterbuck (2001), the formation of social capital through community participation could contribute to the creation of societies that are socially inclusive. Elsewhere, Bebbington (2002) suggested that “social capital could be a useful linguistic device,” and argued that spoken words should be carefully chosen, because such words influence the way people think and act. Bebbington (2002) reiterated that social capital affects the manner in which markets and institutions (private and public) function, and that participation should foster a change in social relationships leading to reduction in exclusion and poverty.

Despite the many benefits of social capital, Kawachi (2000) argued that Social capital excludes outsiders (which Kawachi acknowledges is a negative consequence), restricts individual freedom and makes excessive claims on members. Further, the concept of social capital was perceived to be less tangible, hence its quantification remains a subject of debate (Kawachi 2000; Bebbington 2002). Social capital has been used differently by different scholars, and there is still no firm definition (Kawachi 2000). Bebbington (2002) considered the concept’s coverage to be too broad, encompassing a mix of social assets, including “informal networks of social relationships, membership organisations, generalized social trust, macro institutional relationships.” However, the concept of Social capital has been widely applied (Woolcock and Narayan 2000:225; Clutterbuck 2001; Landry, Amara and Lamari 2001:74; Woolcock 2001; The World Bank 2003), and is considered useful in recognising that marginalised groups such as farmers possess unique social resources that can be used for overcoming exclusion. The concept underscores the crucial role that intermediaries play helping overcome exclusion and gaining positive results. The present study applied social capital to address learning and linkages among farmers’ groups, associations and networks that make groups work together and the social capital yielded by groups. Further, this concept guided understanding of trust, norms and networks among small-scale farmers.

### **3.2.3 Principal models**

Unlike theories, models focus on more limited problems, but are defined in relation to theories (Case 2002:114). Models provide a logical arrangement among concepts and simplify the view of reality by helping to visualise phenomena (Frankfort-Nachmias and Nachmias 1996:43-44). A model is a “framework for thinking about a problem and may evolve into a statement of the relationships among

theoretical propositions” (Wilson 1999:250). Focusing on the field of information behaviour, Wilson (1999:250) described a model as “statements, often in the form of diagrams that attempt to describe an information-seeking activity, the causes and consequences of that activity, or the relationships among stages in information-seeking behaviour.” Further, Järvelin and Wilson (2003) pointed out that models are broader than scientific theories and should reflect reality and guide research in a systematic manner. Models are thus proto-theories and play a useful role at the stages of describing and predicting phenomena (Bates 2005:3). There are a number of information seeking behaviour models relating to theoretical perspectives, and these are often used in combination in the literature, and are complementary because they serve different research purposes (Wilson 1999:250,267; Järvelin and Wilson 2003; Wilson 2006a). Models can be presented conceptually or theoretically (Wilson 1999:250). A number of scholars have recognised the lack of consensus on a common conceptual framework providing a common research language for researching information behaviour, but there are a number of theoretical perspectives (Wilson 1999:249; Järvelin and Wilson 2003; Wilson 2006a).

Kaniki (1989:70) observed that existing theories in information studies on needs assessment methodologies were inadequate and identified some barriers to information seeking from the literature, which included personal characteristics, social/interpersonal, environmental or situational and information source credibility. Elsewhere, Wilson (1999:250) argued that most information seeking behaviour models were still at a pre-theoretical stage but pointed out these models suggested useful relationships. In the opinion of Case (2002:115), information seeking models that are considered fully developed include Wilson’s, Krikelas’, Johnson’s and Leckie’s models. In contrast, Ikoja-Odongo and Mostert (2006:146,149) considered Wilson’s, Krikelas’, Ellis’s, Ingwersen’s, Choo’s, Detlor’s and Turnbull’s models as some of the well regarded and commonly used models. The differences in opinion notwithstanding, the information seeking behaviour component of the present study was guided by Wilson’s general model of information seeking (Wilson 1999; 2005; 2006a; 2006b; Case 2002), while Meyer’s (2000; 2003) model of information transfer to rural communities which was developed in the African context guided some aspects of the study on merging local knowledge and external information.

### **3.2.3.1 Wilson’s general model of information behaviour**

Wilson’s 1991 model focused on information seeking and drew attention to the complexity of the context of observed human information behaviour (Wilson 2005:33). This model covered aspects of information need, its drivers and factors affecting response (Wilson 1997a:39,40; Case 2002:118). Scholars observed that there was a swing from system-centred approaches to approaches that focused on the person (Wilson 2000:51), and a shift from quantitative to qualitative methods (Wilson 2003). Earlier, Wilson (1994) observed that there was a scarcity of work on users of information and their

needs and went on to develop a series of information seeking models (Wilson 1981b; 1994; 1997a; 1997b; 1999). In the process of developing the models, Wilson (1981b; 2006b:659) noted that information was a “troublesome concept,” as there was no consensus on its definition, and it meant different things to different people. He argued that although researchers attempted to define information need, in essence they study information seeking behaviour. Wilson’s 1981 model thus provided a “way of thinking” about user studies to help understand human information behaviour (Wilson 1981b; 2006b:659).

According to Wilson (1981b), “information need” is considered a secondary order need and not a basic need such as food, water and shelter, yet an “information need” is a result of the desire to satisfy the primary needs. Wilson’s 1981 model of information seeking behaviour was based on the physiological, cognitive and affective needs of an individual (Wilson 2000:52), and his approach was phenomenological (Wilson 1994). This model showed the person in context as the focus of information needs and the intervening variables represent barriers (Wilson 1999:256). Emphasising the role of the context under which an individual operates, Wilson (2000:52,2005:31) pointed out that the different contexts determined the barriers that impede the search for information. This 1981 model, comprised 12 components that focus on information seeking, including information user, need, satisfaction or non-satisfaction, information use, information seeking behaviour, demands on information systems and demands on other information sources, information transfer, other people, and information exchange. Furthermore, it provided a way of understanding inter-relationships of information behaviour, information seeking and information retrieval.

However, Wilson’s 1981 model had its limitations as it focused on information seeking behaviour, but did not give adequate attention to informal inter-personal transfer of information among individuals (Wilson 1981b); did not put adequate emphasis on the person, the situation, or, mass media; did not provide an “effective general framework” including the gap that is experienced by a user between situation and use, for studying information seeking behaviour; and lacked stages on information processing and use. It required further elaboration on the concept of barriers or intervening variables to accessing information sources (Wilson and Walsh 1996). The 1981 model also failed to put adequate emphasis on the situation within which the information is found and processed with respect to ICTs (Wilson 1997a). Other critics of Wilson’s 1981 model pointed out that the model assumed that failure was a “dead end” and did not include “feedback” to need (Case 2002:118,128). In Case’s (2002) opinion, Wilson’s 1981 model was too general and although it referred to systems, sources and people, it did not make reference to documents, and it ignored the characteristics of the source and personal preferences.

To address some of the deficiencies identified in the 1981 model, Wilson developed the 1991 improved model which recognised that information was exchanged with other people through an information transfer process during use and seeking behaviours (Case 2002:117). The model also drew attention to the complexity of the context of information seeking behaviour and covered aspects of information need, its drivers and factors affecting response (Wilson 1997a:39,40; Case 2002:117-119). However, the need for a more integrated model of information need, information seeking behaviour and information use led to the development of Wilson's 1994 model, which was based on the Sense-making approach (Wilson 1994). Later studies related to decision making, psychology, innovation, communication and consumer research informed Wilson's 1996 model, which was founded on the assumption that information seeking, searching and use were associated with the different stages of a goal directed problem solving process (problem recognition, problem definition, problem resolution, and (where needed) solution statement (Wilson 1999:256). Wilson's (1997b) general model of information seeking focused on how people seek and make use of information as well as the channels used and what encourages or discourages people from using information, and singled out personal, social, environmental or situational as well as information source characteristics as intervening factors affecting information behaviour. Information processing and use were considered necessary in the feedback loop (Wilson 1999:256-257; 2000:53). Subsequently, Wilson (1999:262) improved on the 1996 model and developed the 1999 model, which has been described as a global problem-solving model.

Wilson's 1999 model shifted emphasis to the complexity of information seeking, and borrows from decision making, psychology, innovation, health and consumer research, and communication theories (Wilson 1999:256; Case 2002:118). This model identifies tentative personal variables and modes of seeking for information (Case 2002:128), and explains how needs prompt people's information seeking behaviour with particular reference to why some needs prompt information seeking more than others (stress coping theory), why some sources of information are used more than others (risk reward theory) and why people may or may not pursue a goal successfully based on personal understandings of their own effectiveness (social learning theory) (Case 2002:118-119; Wilson 2005:31-35; 2006a:682). Wilson (1997b:553-557; 2005:31-35) pointed out that the revised global general model of information seeking behaviour provides for the analysis of the decision based on taking action to satisfy a need based on the Stress coping theory, the decision taken to search various sources based on the risk-reward theory, the theory of self efficacy and is linked to the Sense-making theory. The global model provides a framework for understanding the factors that hinder people from seeking information and for explaining why people take action. The decision to take action and seek information could be explained by i) the context of the information need, ii) the activating mechanism, iii) the intervening variables (psychological, demographic, role or

interpersonal, environmental and source characteristics), iv) activating mechanism and v) the information seeking behaviour (passive attention, passive search, active search and ongoing search).

Although Wilson's 1999 model recognises the different types of search behaviours (passive attention, passive search, active search and ongoing search), scholars have suggested that there was a need for further research on how to motivate people into seeking and using information (Case 2002:119; Wilson 2006a:682). Likewise, McKenzie (2003:19,37) noted that most models, including Wilson's 1999 model were limited in the manner in which they reflected everyday-life information seeking as they did not allow for secondary forms of information behaviour. In addition, these models do not account for information practices such as scanning the environment and chance encounters.

Despite the criticisms, Wilson's models have been singled out as having influenced the theory and practice of information research (Bawden 2006), and are lauded for their simplicity (Wilson 2005; Bawden 2006), hence their popularity in the field of information science (Bawden 2006). Wilson's 1999 general model of information behaviour was applied in a study of information needs and seeking behaviour of artisan fishermen in Uganda (Ikoja-Odongo and Ocholla 2003). The present study also adopted this 1999 model of Wilson's to guide the information needs and seeking behaviour component of the study by providing a framework for understanding how needs prompt farmers to seek information, by focusing on personal variables of seeking.

### **3.2.3.2 Meyer's model of information transfer**

Meyer's (2000:187) model is based on the transfer of agricultural information to small-scale farmers in rural communities. Meyer (2000:59-60,173,203-204; 2003) emphasised the role of information in rural development and the usefulness of information in improving the livelihoods of small-scale farmers. Meyer's (2000:188; 2003) model focused on information transfer to rural communities and took cognisance of the fact that most small-scale farmers are illiterate and originate from oral traditions. Meyer (2000) made the point that farmers were unfamiliar with external information and depended largely on local knowledge. Meyer (2000:187-192,214) argued that it is necessary to transfer modern agricultural information and knowledge to small-scale farmers to ensure rural development. Meyer's model assumes that small-scale farmers are not aware of modern practices and are dependent on their local knowledge. The model was developed on the assumption that it is necessary to deliberately transfer or push external information to farmers to enable them to exploit it.

According to Meyer (2000:160-164,187-192,195-196,203), the transfer of information to illiterate small-scale farmers was dependent on training and required human intervention or a knowledgeable facilitator to manage and coordinate information from the indigenous information systems and the external information systems. Meyer (2000:187,207; 2005) argued that one need not be able to read



and write to use information, hence Meyer's model dwelt on oral cultures and considered the use of metaphor and storytelling, acting, demonstrations, repetition of key concepts during training and revision to be important among rural communities with homogeneous groups of illiterate small-scale farmers. Meyer's merger model combined the modern or external indigenous information systems through communication mechanisms, and took into consideration information usage behaviour, environmental and socio-economic conditions, local policies, infrastructure and the contributions of different stakeholders involved in the farming activities (Meyer 2000; 2002:105; 2003; Meyer and Boon 2003). However, it should be noted that Meyer worked only with a homogenous group of illiterate small-scale farmers hence not all farmers are necessarily reliant on the same type of training as was required by the Phokoane group. The present study used Meyer's model to guide understanding of information transfer to rural communities and the mixing of external and local knowledge by small-scale farmers.

### **3.2.4 Other relevant theories, models, approaches and concepts**

This section reviews other relevant theories, approaches and concepts that contributed to the theoretical framework of study of AKIS including the complexity theory, upon which the Cynefin framework is based on the Principle of Least Effort and the Media use as social action.

#### **3.2.4.1 The Principle of Least Effort “theory” / model**

The Principle of Least Effort theory was suggested by George Kingsley Zipf, (to explain behavior) (Zipf 1949). The premise of this principle is that people tend to solve their immediate problem through spending minimum time, energy and resources (Poole 1985:89-92; Bates 2005:4; Case 2005:289). This phenomenon was described as attempting to minimise work (Zipf 1949:1,6; Bates 2005:4; Case 2005:291), hence individuals tended to adopt the solution or alternative that entailed the least work, expenditure or the least effort. Zipf (1949:1,3) and Poole (1985:108,89) described least effort as the smallest amount of work done in time-space to achieve a particular end or solve a problem. Poole was among the many authors who tested the Principle of Least Effort theory. One of the hypotheses he studied was “People tend to follow the Principle of Least Effort in goal oriented behaviour in order to minimise the perceived cost of their acts,” and findings of interpretations from 40 human behavior studies supported this theory. Zipf referred to the patterns of tending towards the probable least average as “harmonic” distributions and argued that this had to do with “economy of effort” (Zipf 1949:35,120; Case 2002:141; 2007:152). Although Zipf 1949:ix) referred to the Principle of Least Effort as a theory, Bates (2005:4) and Case (2005:290; 2007:151) refute this and Bates (2005:4) argues that it is only a principle that is modelled and not yet a theory. The Principle of Least Effort theory helped to understand why farmers tended to solve problems or seek information through approaches that required minimum time, energy and resources.

#### **3.2.4.2 Media use as social action (MASA)**

The Media use as social action (MASA) builds on to the Uses and gratifications theory and is linked to the communication studies perspective. MASA helps to study users of media and their content. This approach downplays the normative, and assumes that the mass media offers information about things, actions or events through distribution of messages. Information is assumed part of 'sense-making symbolic environment' and the social situations and circumstances determine the relative importance of a message. Viewers, listeners and readers are regarded as factual creators of messages and not pure recipients (Case 2002:148). MASA is closely linked with sense-making as it emphasises interpretation and downplays behaviour objectivity, and is founded on interactionism and phenomenology. Westerik and Renckstorf (2009:2-4) put emphasis on media use as a way of dealing with everyday life problems; hence it is a type of social conduct where users of media are embedded in the social context that influences their actions and lives. In other words, individuals are constantly trying to be on top of situations that they face in time and space. However, Case (2002:148) observed that MASA had not been adopted by many scholars. The present study adopted MASA to interpret the study findings on the use of radio, TV and newspapers for communicating agricultural information and knowledge. For example, TV viewing is assumed to be a routine response to situations that recur in everyday life (Westerik *et al.* 2009:28).

#### **3.2.4.3 Anomalous state-of-knowledge (ASK)**

The Anomalous state-of-knowledge (ASK) concept (Belkin, Oddy and Brooks 1982; Belkin 2005:44,47) is an anomaly or gap for information that arises when an individual becomes aware that the knowledge and information they received was not sufficient to solve the problem or situation that they were in. The information gap then created another need to receive the missing information, which motivated users to seek information. As pointed out by Stilwell (2002:70) the ASK helps to explore incomplete information.

#### **3.2.4.4 Complexity theory**

The present study took Complexity theory into consideration in the investigation of the multidisciplinary and complex nature of AKIS, specifically in the context of the Cynefin framework (see **section 3.2.5**). Lewis (1994:16) defined complexity as the area between chaos and unpredictability, where systems adapt, learn and grow. Complexity explains the evolution of organisms and supports the suggestion that there are constant interactions with other agents in the environment without conflict or cooperation. Complexity occupies the space between order and chaos, where there is potential for maximum creativity and possibilities (Keene 2000:16). For McElroy (2000:196,199), complexity is partly described as "the study of pervasive innovation," where knowledge and continuous learning are viewed as powerful preconditions to success.

Complexity theorists maintain that “systems will not transform unless taken to far-from-equilibrium conditions” (Dooley, Johnson and Bush 1995:21), and that underlying the chaos is discovery (Rosenhead 1998). Hence, the theory stresses the potential capacity of being on the border of chaos (McElroy 2000:196). Complexity theory addresses complex multi-directional and non-linear relationships and offers tools for examining disruptive and fluid experiences (Styhre 2002a:347-348). These non-linear relationships can evolve into complex adaptive solutions (Anderson 1999:217). Information systems can be considered as “complex adaptive systems” (Benbya and McKelvey 2006:17). Consequently, a small change in one or two parameters in a non-linear system could result into a drastic change in the behaviour of the entire system (Anderson 1999:217). In describing the Complexity theory, McElroy (2000:196) posited that it is the study of emergent order among disorderly systems, some of which are nearing chaos. For Letiche (2000:545), Complexity theory was a collection of new non-physical (anti-mechanistic) metaphors that emphasise process and emergence and result in “radical process thinking.” The key concepts addressed in the Complexity theory include emergence, self-organisation, complex adaptive systems, attractors and the "edge of chaos", hence studying these concepts could lead to multiple interpretations.

According to Gault and Jaccaci (1996:35), Complexity theory considers all systems including human systems and offers a platform that provides reasons for the behaviour of all systems. This view was supported by McElroy (2000:195,200), who viewed Complexity theory as “systems thinking in practice.” He saw convergence between knowledge management, organisational learning and Complexity theory. Goulielmos (2005:542) conceptualised Complexity theory as “the theory using dynamic thinking” in relation to the on-going activities in a complex society. The view held by McElroy (2000) and Goulielmos (2005) was shared by Smith (2005:24), who visualised the Complexity theory as a perspective for interpreting the behaviour of a collection of interacting units. Complexity thinking suggests that the causes of some events may not be known (meaning not necessarily impossible), probably because of inadequate information about the constituents of the system (Smith 2005:28). Benbya and McKelvey (2006:16,17) argued that the Complexity theory provides a way of thinking about systems with interacting organisms and is based on the assumption that order emerges through interactions. In addition, scholars have argued that complex phenomena could arise from simple rules, and because humans are unpredictable and intelligent, then it follows that human complex systems cannot be compared with natural complex systems (Snowden and Boone 2007:71).

Critics of Complexity theory have argued that there are challenges in the practical application and operationalisation of the theory, in addressing co-evolutionary complexities that lead to convoluted details that result from too much interdependence within an organisation (mutual causal changes) between different players or elements (McKelvey 1999b:294,299,313). Smith and Graetz (2006)

argued that translation of outcome into action could be troublesome. Furthermore, Rosenhead (1998) and Smith and Graetz (2006) emphasised that Complexity theory is still young but progressing significantly. These shortcomings notwithstanding, Complexity theory has been applied by a number of scholars in the study of organisations (Lewis 1994; Smith 2005; Smith and Graetz 2006), design of information systems (Benbya and McKelvey 2006), and strategy (E Cunha and Da Cunha 2006) among others. As discussed below under frameworks (see **section 3.2.5**) the development of the Cynefin framework was based on the Complexity theory to address issues that were complex and critical (Kurtz and Snowden 2003). This theory was thus extended to certain aspects of the present study using the Cynefin framework to understand the interrelationships between agricultural actors, innovation and decision making among small-scale farmers and farmers' groups.

### **3.2.5 Principal framework – Cynefin framework**

Some of the literature has used the term model and framework interchangeably (Wilson 1999:250; Järvelin and Wilson 2003). However, the *Merriam Webster's Online Dictionary* described a framework as a conceptual structure proposed to support or guide the construction of something that expands into something useful. Wong and Aspinwall (2004:94) interpreted a framework as “a structure that comprises relevant entities or a set of guiding principles and ideas that support a discipline.” Frameworks, therefore, secure links between theory and practice (Wong and Aspinwall 2004:94). The present study drew on the Cynefin framework, which is discussed below.

Cynefin is a Welsh word that denotes the many different factors prevailing in our environment and experience that determine how we understand complex phenomena (Snowden and Boone 2007:70). Cynefin is a sense-making framework that originated in the practice of knowledge management and according to Kurtz and Snowden (2003:462,466), humans use patterns to order the world and make sense where situations appear complex. Cynefin offers a categorisation framework that supports people's decision making approaches (Kurtz and Snowden 2003:467,473; Snowden 2005a). The framework is informed by Dervin's Sense-Making methodology and is considered to be a powerful problem solving tool (Kurtz and Snowden 2003:462,466,467). This framework is based on narrative methods and the Complexity theory (see **section 3.2.4.4**), which help to reveal patterns of behaviour and understanding of individuals and groups from multiple affiliations such as culture, religion and geography (Kurtz and Snowden 2003:467-468). For Snowden (2000; 2002a:105; 2005b:561), informal communities arise out of mutual interaction and interdependency over time and community interaction is required for the creation and exchange of knowledge along with learning mechanisms.

The Cynefin framework is a phenomenological framework that is split into two major groups (known and unknown), and five domains that are determined by the nature of the relationships between

cause-effect. The central part forms the disorder domain (Snowden 2002a:104; 2005a:50; Kurtz and Snowden 2003:468; Snowden 2005c:45; Mark and Snowden 2006; Snowden and Boone 2007:70). Three ontologies namely ordered, complex and chaotic were proposed, from which human interactions may be addressed (Snowden 2002b:3). Indeed the framework is based on the assumption that all systems have an underlying relationship between cause and effect that can be discovered or approximated (Snowden 2005a:47). The following section briefly discusses the five domains. On the one hand is the ordered category that comprises the known and knowable sub-groups (Kurtz and Snowden 2003:469-470; 2005a:50; Mark and Snowden 2006; Snowden and Boone 2007:70).

- i) Under the known or simple domain, the cause-effect relationship is linear and clear, and refers to things that are known in society. This domain allows for the creation of predictive models and the practice of best practices. Here knowledge is captured and is embedded in structured processes to ensure efficiency, and the domain is characterised by stability and leaders can sense, categorise and respond easily (Snowden 2002a:106; 2005a:50; Kurtz and Snowden 2003:469-470; Mark and Snowden 2006). Both managers and employees have access to information and adhere to best practices and disagreements are rare.
- ii) The knowable domain has also been referred to as the complicated domain or the domain of experts (Snowden and Boone 2007:71). This domain may contain multiple right answers and although the cause and effect relationships are clear, the link may not be fully visible to everyone, for example in cases such as systems thinking and learning organisation, which require further analysis and expert knowledge (sensing of data, analysing, responding) to understand the patterns. Contents of this domain can, however, move to the known domain but the process requires time and resources. Systems thinking and learning fall under this domain, which allows for experiments, expert opinion and fact finding (Snowden 2002a:106; 2005a:50; Kurtz and Snowden 2003:469-470; Mark and Snowden 2006). The complicated domain calls for the investigation of multiple good practice options (Snowden and Boone 2007:71). Under this domain, incoming data is first sensed and analysed, followed by appropriate response, and is appropriate for systems that exhibit stable patterns (Mark and Snowden 2006; Snowden and Boone 2007:71). These authors emphasised that “the known and knowable domains are not based on individuals” but rather on the society or the collective unit.

On the other hand is the un-ordered group that suggests the existence of a different order that needs to be changed to be understood. These comprise the complex and chaotic sub-groups.

- iii) The complex domain, also referred to as the domain of emergence (Snowden and Boone 2007:74) is the area where there are multiple dynamic interacting elements and is the home of the Complexity theory. Complexity is a way of thinking about the world that helps people to make sense of phenomena, where one cannot forecast what will happen (Snowden and Boone 2007:71).

The cause and effect relationships cannot be perceived in advance under the complex domain, but interactions produce emergent order that may not be repeatable or predictable. Expert opinion and narrative techniques thus become necessary to be able to probe the emergent order and make sense of the complex relationships in retrospect. Narrative techniques are considered appropriate for studying complex systems. Under the complex domain, the leader first probes issues, then senses, and finally responds through emergent practices (Snowden 2002a:106; 2005a:50; Mark and Snowden 2006; Snowden and Boone 2007:71,74).

- iv) The chaotic domain experiences turbulence and cause and effect relationships are considered impossible to determine. Often people act to establish order, then make sense of where there is stability and instability and subsequently respond to transform the situation from chaos to complexity. Under this domain, the decision is to act speedily to reduce confusion, then sense the reaction before responding appropriately. The chaotic domain offers possibilities for new discovery and innovation (novel practices) (Kurtz and Snowden 2003:469; Snowden 2005a:50,52; Snowden and Boone 2007:74). According to Kurtz and Snowden (2003:469,479), best practice cannot be applied in this domain and neither can one wait for patterns to emerge. Sharing strategies within organisations entails providing freedom within “heuristic boundaries,” to pave way for new patterns to emerge. The chaotic domain has the potential to move into the complex space and patterns can be created through multiple interventions. As emphasised by Snowden (2005a:50), chaos is the antithesis of order.
- v) The disorder domain is found at the heart of the Cynefin framework. This is the space where conflicts among decision makers exist. Decisions within this domain depend on individual preferences for action in regard to the above four domains. Under this domain, narrative techniques are used to capture information from individuals and groups (Kurtz and Snowden 2003:468; Mark and Snowden 2006). In other words, disorder occurs when it is not clear which of the four domains is predominant. Under the disorder domain, decisions are made by breaking down issues into sub components and each component is assigned to the four realms. The intervention is then appropriately arrived upon based on the context of the specific problem and sub component (Snowden and Boone 2007:70,72).

The Cynefin framework provides a way of addressing cultural issues and understanding cultural interventions by allowing the emergence of new meanings and solutions (Snowden 2002b:2,6). Snowden regarded culture to be the patterning of human interactions with the environment and linked human decision making to human patterning. In other words, people tend to respond by matching the patterns of their colleagues. Snowden (2002b:3) argued that culture should be addressed from different perspectives to ensure effective systems. He emphasised that in respect to culture, human systems are not ordered systems. Snowden (2005c:45) therefore introduced new simplicity into the process of decision making, based on order and disorder. As pointed out by Kurtz

and Snowden (2003), the diagnosis and design of interventions requires different approaches based on the domains advanced. In addition, the Cynefin framework allows people to think out of the box and see things from new viewpoints that incorporate complex constructs and focus on real world problems and opportunities. Snowden and Boone (2007:70) further observed that this framework guides the process of good decision making.

However, it has been argued that the Cynefin framework has limitations. Some researchers argue that the narrative technique does not have acceptance as a scientific research approach (Mark and Snowden 2006). Nevertheless, this framework has been applied by a number of researchers, including Cheuk (2005:2) in studying information seeking and use behaviour, by Cronjé and Burger (2006) in their study on learning using digital information kiosks and knowledge management, and by Mark and Snowden (2006) in health care innovation. Snowden (2005a:48) asserted that an understanding of complex systems can improve decision making. Some scholars have also demonstrated the potential of combining Snowden's Cynefin framework with Dervin's Sense-making theory for different applications such as knowledge management (Cheuk 2007a; 2007b) and business and knowledge transfer (Linderman 2007).

Furthermore, a study carried out by Linderman (2007:1) and colleagues concluded that most methods for studying the articulation of tacit knowledge were inadequate, and not grounded in dialogic theory. This study rated the Cynefin framework as one of the few methods that had proved useful. Given its wide application, and its demonstrated potential in studying complex systems, the present study applied the Cynefin framework to investigate aspects of the study pertaining to innovation, decision making among small-scale farmers and the relationships during focus group discussions with farmers. The Cynefin framework helped the researcher to address the complexities of AKIS caused by the interactions of multiple actors that yielded cooperation or conflict (Keene 2000:16; McElroy 2000:196,199; Snowden and Boone 2007:70). The Cynefin framework provided the underlying structure for understanding the information seeking and use behaviour by men, women and the youth and to identify patterns and experiences of farmers in sharing agricultural knowledge and information, and to visualise similarities and differences in the information seeking behaviour between men, women and the youth. It allowed for diverse perspectives thus paving the way for patterns to emerge from converging experiences in the ordered domain, and providing freedom within heuristic boundaries for new patterns to emerge in the chaos domain.

### **3.3 Summary**

Chapter three highlighted the paradigmatic and theoretical underpinnings of the study. The Chapter briefly discussed the main research paradigms and the theoretical framework, upon which the study was based. The Chapter examined a triangulation of paradigms with a view to providing an

understanding of the “worldviews” from different philosophical view points. In addition, the Chapter examined the soft systems and systems thinking, the knowledge systems and knowledge and information systems perspective. The principle paradigms, perspectives, theories, models, concepts and frameworks that guided the study were discussed. As justified by Pretty (1994:38) and Creswell (2003:136), a triangulation of theories was used to ensure proper interpretations of the world and to obtain objectivity.



## CHAPTER FOUR: LITERATURE REVIEW

### 4.0 Introduction

Chapter four presents a review of the literature on AKIS and small-scale farmers. The chapter mounts a landscape of AKIS studies, providing a global, African and Kenyan perspective and the role that different actors, including small-scale farmers' groups play in supporting agricultural development. The scope of the literature review was limited to the information behaviour of key agricultural actors, their sources of information and knowledge, linkages and flows of knowledge and information (including the role of ICTs), usage of information and knowledge, barriers to accessing knowledge and information and existing knowledge management and information management practices. This Chapter also discusses past AKIS models and highlights their features and limitations, which partially guided the features added in the proposed flexible AKIS model for small-scale farmers in Kirinyaga district.

McCracken (1998:31) remarked that literature reviews are a kind of qualitative analysis that collect ideas and are “critical undertakings in which the investigator exercises a constant scepticism.” Literature reviews seek out conscious and unconscious assumptions and determine how the assumptions influence the research problems and findings in the area of investigation. A review of the literature involves the finding, reading and evaluating of outputs of previous studies, observations and opinions pertaining to the area of investigation (Mugenda and Mugenda 2003:14). It surveys scholarly texts and empirical studies on previous research and expands the foundation for further research thus determining the importance of the research area (Frankfort-Nachmias and Nachmias 1996:558; Kothari 2004:28; Sheppard 2004:53-55; Gravetter and Forzano 2009:48). Further, it captures published and unpublished work from secondary sources and draws attention to important variables as determined in previous studies that are related to the research problem being investigated and significant findings in the area of investigation (Hart 1998:10-11; Mugenda and Mugenda 2003:29-35; Sekaran 2003:63,67,97). A literature review summarises the important aspects of past research (Frankfort-Nachmias and Nachmias 1996:558; Cooper and Schindler 2003:101), and aids the development of data collection tools (McCracken 1998:31). It explains the need for the proposed work to appraise the gaps or shortcomings of the literature and interprets them in the research problem (Wright 2000:201; Cooper and Schindler 2003:101-102; Polit and Beck 2004:88).

Literature surveys provide a solid foundation for developing the theoretical framework and covering the relevant theories of previous studies (Hart 1998:14; Wright 2000:202; Sekaran 2003:67,97). In other words, it takes into account the agreements and disagreements and the work of key writers in the field (Wright 2000:202), and reviews research undertaken on related problems (Hart 1998:10-11; Sekaran 2003:63,67). Kothari (2004:28) concurred with Wright (2000:202), and concluded that the

literature review spells out techniques used and data available, and thus guides the researcher to existing gaps in theories, difficulties encountered, analytical shortcomings, inconsistencies and emerging patterns pertaining to the theories used. A literature review formulates themes that express what has been published, issues deemed to be of value and trends on how knowledge in a particular area has developed over time (Kothari 2004:28). In addition, it examines the methodologies used, explaining how data and information are collected and the underlying philosophical assumptions supporting the methods. In sum, a literature review is a critical evaluation of the pertinent literature on the problem, which provides the structure that frame up the research problem and provides rationale for conducting the study (Hesse-Biber 2010:36-37).

In his write-up on intellectual craftsmanship, Wright (2000:201) underscored the point that “good work in social science today is not, and usually cannot, be made up of one clear cut empirical “research,” but rather, is composed of many studies. A literature review therefore anchors the work of a researcher in a given field, and helps to identify knowledge gaps and developments, as well as the refining of the research problem from the general to the specific (Kaniki 2006:19-21). Kaniki (2006:19-21) concluded, “a literature review should highlight pertinent literature and contribute to the field by providing a novel and focused reading of the literature” and present a structured argument. It should summarise the empirical findings, and focus on the different methodologies used. As recently summed up by Fink (2010:3,8), a literature review is a “systematic, explicit, reproducible” method for gathering, fixing value of worth and combining or synthesising completed works, and for describing and explaining current and retrospective knowledge. The literature review of the present study examined recent and retrospective studies on AKIS, agricultural information and knowledge that acted as a basis for the present study and emphasises the methodologies used, important results and conclusions, as well as gaps in knowledge.

#### **4.1 The key concepts of an agricultural knowledge and information system (AKIS)**

The pivotal concepts within an AKIS include i) *systems* that are virtual and provide a way of thinking such as the *knowledge and information system*, *agricultural information system*, *agricultural knowledge system* and *agricultural knowledge and information system*; ii) the boundary, which is defined by the problem or geographical location and the line between actors that form the system and the importance of the *actors*, iii) *linkages* that illustrate how actors communicate and are directed to joint effort, and iv) *linkage mechanisms* that facilitate communication, coordination and resource transfer (Salomon and Engel 1997a:19-20). For Rölöing (1988:180-189), the conceptual aspects of AKIS include the *role of knowledge and information* (see **section 4.4**), environments, *data, information and knowledge* (see **section 4.1.5**) and *systems*. Distinguishing between an information system and a knowledge system, Rölöing (1988:32) pointed out that while information is explicit and can be transmitted, knowledge is tacit

and is in the brain and can be generated and utilised. The key concepts of AKIS are discussed below (see also definition of key terms in the preliminary pages).

#### **4.1.1 Knowledge and information system (KIS)**

A KIS is defined as a set of people, institutions, organisations and networks that are linked to each other for the purpose of innovation (Salomon and Engel 1997a:74). The construct innovation is discussed in **section 4.1.5**, while linkages are covered in **section 4.7.3**. The concept “systems” has been used for analytical purposes to represent complex phenomena that are hard to analyse through conventional scientific analysis, such as the agricultural information system (Hurtubise 1984 cited in Rölöing 1988:186-188). For Hurtubise (1984), a system is essentially an arrangement of parts comprising elements, components and sub-systems that interact towards a shared goal, and with synergistic effects on the whole, and linkage mechanisms facilitate interactions between the system components (Rölöing 1988:187-188) (see definition of key terms in the preliminary pages ). The systems approach discussed in detail in **section 3.2.1.1.1** and provides an holistic approach for studying complex issues (Petersen 1997; Rölöing and Wagemakers 1998:16; Gao, Li and Nakamori 2001:10-16; Nakamori 2006:12), and projects beyond personalities and events (Senge 2006:7,42,73). KISs do not exist in practice and are imaginary but provide “a way of thinking that helps us understand the social organization of innovation in agriculture better” (Salomon and Engel 1997a:19). Although systems have been critiqued for being abstract, they provide understanding of the barriers and drivers of two-way technology and information flow between farmers and other actors in the system (Petersen 1997). All AKIS actors “manage, generate, transform, transmit, store, retrieve, integrate, diffuse and use knowledge and information,” and the performance of the system is dependent on their common objectives, how the different actors cooperate, communicate, and coordinate specialised tasks (Salomon and Engel 1997a:19,74). The relationship between the concepts data, information and knowledge are discussed in **section 4.1.5**.

#### **4.1.2 Agricultural information system (AIS)**

Rölöing (1988:xi,33) defined AIS as “a system in which agricultural information is generated, transformed, transferred, consolidated, received and fed back in such a manner that these processes function synergically to underpin knowledge utilisation by agricultural producers.” According to Rölöing (1988), various vertical (top-down and bottom-up), and horizontal information flows take place within the AIS, generating a complex phenomenon. An AIS serves as a tool for analysis and design of agricultural research, extension and agricultural knowledge utilisation. Linked to AIS is the concept of agricultural knowledge system.

### **4.1.3 Agricultural knowledge system (AKS)**

An AKS is defined as “a system of beliefs, cognitions, models, theories, concepts, and other products of the mind in which the (vicarious) experience of a person or group with respect to agricultural production is accumulated” Rölíng (1988:33). Different groups of people have knowledge systems including local knowledge (see **section 4.1.5**), which affect their perception, learning and reasoning (Rölíng 1988:33). Bunting (1986 cited in Rivera, Qamar and Mwandemere 2005:12) identified five elements of AKSs namely i) the existing stock of knowledge (memory), ii) the means of increasing knowledge (experience, surveys, research), iii) the means of testing and developing knowledge (research and development), iv) the practical application of knowledge, and v) the dissemination of knowledge (education, training and extension). Different individuals and groups have knowledge systems (Rölíng 1988:33), and various authors (Rölíng 1988:186; Ekoi and Hepelwa 2003; Meyer 2003b; Ibui 2007:4) have pointed out that there has been increased interest in local knowledge systems (see **section 4.1.5 and 4.4.3**). Ekoi and Hepelwa (2003) argued that it was important to understand the knowledge systems at the local level before deciding on any systems or improvements. In addition, Brooks (2006:xxv) stressed the need to strengthen collaboration between national scientific and technical information and global knowledge systems to enhance productivity and innovation (see **section 4.1.7** and definition of key terms in the preliminary pages). The present study aims to understand not only the AKS but also the AKIS of small-scale farmers in Kirinyaga district, in a bid to supporting agricultural development and linkages between key actors.

### **4.1.4 The concept of AKIS**

The different actors in agricultural development who manage knowledge and information (see **section 4.1.6**) “gel” together to form the agricultural knowledge and information system (Salomon and Engel 1997a:19). An AKIS is a relatively new concept (Rivera, Qamar and Mwandemere 2005:11), that addresses linkages of key actors in the agricultural sector. Eicher (1999:33) described an AKIS as an “agricultural knowledge triangle,” depicting a “two-way flow of information and knowledge” between farmers and agricultural actors (Ramirez 1997). As discussed in **section 1.0**, an AKIS is a system that “links rural people and institutions to promote mutual learning and generate, share and utilise agriculture-related technology, knowledge and information” (FAO and The World Bank 2000). It facilitates the interaction of the main agricultural actors (farmers, agricultural educators, researchers and extensionists), and has the potential to harness knowledge and information from various sources for better farming, improved agricultural growth and livelihoods (The World Bank 2004c; Rivera, Qamar and Mwandemere 2005:vi). An AKIS consists of institutions and organisations pertaining to agricultural extension, research and education that generate and disseminate knowledge and information (The World Bank 2004c). In addition, an AKIS supports inter-related components in agricultural production, marketing and post-harvest

handling (The World Bank 2004c), and encompasses institutions, service providers and users involved in agricultural knowledge and information systems (Rivera, Qamar and Mwandemere 2005:11).

An AKIS provides a conceptual framework that allows researchers to see wholes and provide for comparative analyses (Röling 1989:74). It increases the synergy of its components, making the contribution of the total AKIS exceed the sum of the components (Röling 1989:2). An AKIS is essential to success and community development and facilitates participation, sharing and exchange of knowledge and information (Engel and Salomon 1997), strengthening of linkages and transfer of technologies (Rivera, Qamar and Mwandemere 2005:11). The “systems thinking” approach (see **section 3.2.1.1.1**) adopted by AKIS helps actors to tackle complex issues holistically (Röling and Wagemakers 1998:16). Fisk, Hesterman and Thorburn (1998:218) concurred with this point and explained that like ecology, community members do not exist in isolation, but rather, are enmeshed in the fabric of society and culture from which they come. According to Fisk, Hesterman and Thorburn (1998), solutions to complex social problems emerge from community members, and AKIS helps to see wholes, recognise patterns, and interrelationships, how to effectively structure them and enable learning. Further, an AKIS helps researchers and extensionists to focus on actors within the AKIS who contribute more to agricultural innovation by looking beyond broad categories and focusing on other types of actors (Salomon and Engel 1997a:19). It helps to address problems inherent in the agricultural sector and integrates the efforts of the different segments by collecting together their intellectual capital in an holistic way (McDowell 2004).

AKISs take into consideration the local environment, social, economic, technological and regulatory parameters of its users (Asopa and Beye 1997b; Rees *et al.* 2000). Moussa (2006) reinforced this point and suggested that priority should be given to the local value systems and economic perceptions of farmers. In addition, Karami (2006) contended that AKISs should be dynamic and responsive to farmers’ information and knowledge needs and changing policies.

#### **4.1.5 Data, information and knowledge**

Data is defined as “observations of states of the world” (Davenport and Prusak 1997:9). It is a group of objective facts about an event that does not state something meaningful (Tiwana 2002:39). Data are a measure expressed in numbers or other characteristics of an entity obtained from observing and recording measurement, experiment, or calculation (Bergeron 2003:6,8). To Wilson (2002c), everything that can be manipulated outside the mind was data. According to Tiwana (2002:39), data are inputs into a system, and can be transformed to information, hence any “collections of messages” that were organised in some way were “information resources” (Wilson 2002c). In other words, data is content that is observed directly and can be verified, for instance, the locations and number of times movies were shown on a given day (Dalkir 2005:7). Information has been defined as “data endowed

with relevance and purpose” (Drucker 1998:5), or data that is organised and processed, and as a new “basic resource” (Drucker 1999:27; 2007:63). For Bergeron (2003:6,8), information was data that has been patterned or formatted for informing people and reducing uncertainty or an assemblage of data pertaining to a process, event or object providing explanation or interpretation. Thus, data and information may be managed, and information resources may be managed.

Plato’s (1953) definition of knowledge as “justified true belief” has been adopted by other authors (Nonaka and Takeuchi 1995:58). Knowledge has also been defined as information that is organised and combined to form a synthesis that enhances awareness or understanding. On the other hand, Dervin (1998:36) defined knowledge as the “sense made at a particular point in time-space by someone,” which is sometimes shared, codified, agreed upon by other people, enters formal discussion and gets published, tested, takes on the status of facts, may be unexpressed, hidden and suppressed. Still, Sallis and Jones (2002:8) defined knowledge as “information in use,” and argued, “it is the interaction of information with the human mind that gives it meaning and purpose.” Alavi and Leidner (2001:109) described knowledge as “information possessed in the mind of individuals.” A process is applied to this information, which may translate to expertise or wisdom (Liebowitz 1999:iv). Wilson (2002c) considered knowledge to be “what we know,” and involves “mental processes of comprehension, understanding and learning that go on in the mind.” He argued that knowledge cannot be managed, with the exception of the case of the individual knower, where they could only be imperfectly managed, because people have little control over what they know, and often we “do not know what we know,” but that what we know emerges as needs arise. For Tiwana (2002:37), knowledge was considered to be information that is applied and results in action in the form of decisions made. According to Rölöing (1988:185,186), knowledge was an attribute of the mind that is the outcome of “lifelong information processing, storage and retrieval” that can be shared and accumulated. A key observation by Rölöing (1988:181-186) was that the generation of new knowledge is a survival mechanism and an aspect of coping with the environment. This process was not limited to researchers, but was incorporated in the collective store of local knowledge and the roles that the different agricultural actors play. Knowledge consists of “truths, beliefs, perspectives and concepts, judgements and expectations, methodologies and know-how” (Wiig 1999:3-2). An individual’s operational knowledge is thus represented by the unique mental or reference models that they possess in their minds based on what they have learned, their thoughts, experimentation, experiences and surrounding environment (Wiig 2004:83). Knowledge is thus a “critical resource” that is indispensable to the success of organisations (Bodhanya 2008:3,20).

Knowledge may be global, local, external or indigenous. As pointed out by Von Liebenstein (2000), global and indigenous knowledge is unique and different. Local knowledge is also referred to as indigenous, traditional knowledge (Nakashima and Roué 2002), indigenous science, farmers’

knowledge, folk knowledge (ICSU 2002:2), traditional ecological knowledge, rural people's knowledge, or marginalised people's knowledge (Kothari 2002:226). Indigenous knowledge stresses linkages with the indigenous people of a particular place. In essence, this definition excludes populations that may be knowledgeable about their natural environments but not indigenous people to the area (ICSU 2002:9). Nakashima and Roué (2002) also argued that the term indigenous knowledge was confusing in that it did not specify who was "indigenous." Besides, it had a negative connotation because of its linkage to the colonial oppressors.

Local knowledge or farmers' knowledge was sometimes a preferred term because it included non-indigenous farmers and other knowledgeable practitioners across generations. McCorkle (1989) argued that there was agreement from two conferences on marginalised people's knowledge, which pointed to the use of local knowledge as the preferred term that captures all such phenomena. Failing, Gregory and Harstone (2007:48) concurred that the term local knowledge was more comprehensive and descriptive. Nevertheless, critics of the term local knowledge have argued that use of the term does not specify what local really means (ICSU 2002:9; Nakashima and Roué 2002). Although some scholars conceptualised indigenous knowledge as a subset of local knowledge, others have argued that there has always been interaction with other knowledge systems (indigenous and external), through trade and exchanges, hence the local knowledge was cross fertilised by elements from outside knowledge (other communities and cultures), as well as by local dynamism (Gupta 2001:4; Kothari 2002:227). In addition, knowledge can be produced by individuals either locally or indigenously without external interference (Gupta 2001:4), through experiences, skills and insights that individuals apply to improve their livelihoods (Rao 2006:224). The present study used the term local knowledge, as informed by Nakashima and Roué (2002) and Failing, Gregory and Harstone (2007:48).

According to Stalino Kibet (personal communication, research scientist 19 July 2008) of the National Museums of Kenya's Kenya Resource Centre for Indigenous Knowledge (KENRIK), indigenous knowledge pertains to knowledge of people who are indigenous to a place over many generations. Local knowledge relates to knowledge that has been developed in a given geographical locality over many years by people who may be outsiders, emanating from a mix of cultures of people who have moved in and settled in a place. Broadly, indigenous knowledge has been defined as "the unique, traditional, local knowledge existing within and developed around specific conditions of women and men indigenous to a particular geographic area (Grenier 1998). This knowledge is hived away in the memories of people (Grenier 1998; Wiig 1999), and is unique to a specific culture<sup>28</sup> of a community

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<sup>28</sup> The cultural heritage of a society relates to all visible marks and activities of human existence of a particular society, including all tangible and intangible aspects of the lives of people as passed on to them through generations and modified over time (Gichere 2008:4).

or society (Warren, Sikkerveer and Brokensha 1995:xv). Local or traditional communities include people within a given locality with a pool of knowledge and expertise that is preserved over the years. These people have a specific interest and a self identity (Emery 2000:11).

Indigenous or local knowledge is unique to a particular culture and society, and forms the basis of local decision making and problem solving in agriculture, natural resources management and other survival activities (Woytek 1998:1-3). This knowledge is “a way of life” that entails acquiring and passing on knowledge and understanding in form of values, stories, language and social relations to future generations (Emery 2000:16). It has also been described as the “complex arrays of knowledge, know-how, practices and representations that guide human societies in their innumerable interactions with the natural milieu: agriculture and animal husbandry; hunting, fishing and gathering ...” (Nakashima and Roué 2002). According to the ICSU (2002:9), traditional knowledge is “a cumulative body of knowledge, know-how, practices and representations maintained and developed by peoples with extended histories and interaction with the natural environment. These sophisticated sets of understandings, interpretations and meanings are part and parcel of a cultural complex that encompasses language, naming and classification systems, resource use practices, ritual, spirituality and worldview.” As pointed out by Röling (2004:15), the indigenous knowledge systems of farmers “represent sustainable, resilient and intelligent forms of agriculture that have supported expanding communities over the centuries.”

Local knowledge is holistic (not analytical and interlocks empirical, spiritual, social and other components), local in character, and is rooted to a specific rural setting at a specific period (ICSU 2002:10; Agrawal 2004). It is simple, practical and dynamic and is characterised by people’s changing needs (Agrawal 2004; Saway 2004). Local knowledge is not usually written, hence is orally transmitted through traditions and through human senses (seeing, touching, smelling), and is considered a common heritage. It draws together the social, economic, political, spiritual, meta physical and cultural elements (Saway 2004).

According to Turnbull (1997:552,559-560) the issue of “power” is a major issue in the difference between western science and other knowledge systems. However, Turnbull (1997) showed that although western scientific knowledge was perceived to be more superior or powerful by some people, western knowledge also failed at times and farmers were compelled to fall back on their traditional knowledge. For example, in the case of the green revolution, farmers using the water control and distribution approach for irrigating rice in Bali, Indonesia realised that the perceived superior western knowledge was not efficient, hence fell back on the old system of temple control. In other words, the power of the local people was recognised and was passed back to the community (Turnbull 1997:559-560). As emphasised by Turnbull (1997:559-560), “diversity is the key to



survival.” Kloppenburg (2009:255-257) pointed out that there are multiple complementary sources of knowledge and that there was no particular intellectual source that offered sufficient resources. Kloppenburg (2009) argued that the solution to farm problems rests in the integration of farmers and their local knowledge into scientific knowledge production. Tengo and Belfrage’s (2004) viewed local knowledge as a blend of knowledge generated locally through practice and experience, and incorporating knowledge from external sources. A study conducted by Tengo and Belfrage’s (2004) in Tanzania and Sweden demonstrated that local ecological knowledge was a blend of knowledge generated locally through practice and experience and incorporating knowledge incorporated from external sources. Briggs (2005) concurred with Tengo and Belfrage’s (2004) view, and explained that farmers and other rural communities relied on a hybrid or dual knowledge to ensure their daily existence by continuously developing and innovating to ensure survival under their circumstances.

On the other hand, scientific knowledge, also referred to as western or global knowledge has been described as knowledge generated through research and education institutions’ networks (Warren, Sikkerveer and Brokensha 1995:xv). As an example, the knowledge resulting from the research process is “tacit knowledge” (Kuhn 1970:191). This scientific knowledge is the “common property of a group or else nothing at all,” and completed scientific accomplishments are recorded in textbooks, classics, journals and by specialist societies (Kuhn 1970:1,19,210). For Wiig (1999), external knowledge was that knowledge coming from publications, professionals or other actors. Global knowledge was considered knowledge, which originated from industrialised countries (Von Liebenstein 2000:6-7) and “an abstract entity independent from practice (Nakashima and Roué 2002). Scientific knowledge is deemed to be open, systematic and objective and grows by building on earlier accomplishments (Agrawal 2004).

Although discussing the demarcation between local and scientific knowledge is beyond the scope of the present study, Gupta (2001:3) was of the view that local knowledge blended traditional skills, culture and artefacts with modern skills, perspectives and tools. Saway (2004:9) considered the link between local and external knowledge to be “common sense,” and argued that external knowledge cannot disassociate itself from the structure and framework of local knowledge. Agrawal (2004) considered the classification of knowledge into local and scientific to be ridiculous, because there were no specific boundaries between local and scientific knowledge, and there were differences and similarities across them. Further, Briggs (2005) argued that there may be no pristine indigenous knowledge and it may be more appropriate to make reference to local knowledge. It can also be argued that there is no pure Western scientific knowledge, as this type of knowledge is also complex, heterogeneous and a blend of different knowledge traditions (Turnbull 1997:560).

Efforts by Agrawal (2004) to further explore the concept of local knowledge pointed out some differences between local knowledge and scientific knowledge, including: i) differences in the characteristics and subject matter, ii) the two schools of knowledge stem from different epistemological backgrounds, iii) traditional knowledge focuses more on its local environment, iv) there are differences with respect to the history of local and scientific knowledge. v) Saway (2004:9) added that natural conditions (the environment and nature) shape the development of local knowledge, whereas change in scientific knowledge occurs through human action (human intervention and experimentation). However, Agrawal (2004) explained that in some disciplines, there were some similarities in the categorisation of local and scientific knowledge, for example in agroforestry systems (Rocheleau 1988). Making an additional point, the ICSU (2002:12) affirmed that traditional knowledge had always informed science. Although scholars such as Warren *et al.* (1993) asserted that local knowledge should be systematically documented in databases, newsletters and other media for wider dissemination, Agrawal (2004) argued that archiving and disseminating local knowledge would be contradictory to “indigenous” in the indigenous knowledge concept.

As discussed in the definition of key terms in the preliminary pages, knowledge may be explicit or tacit (Nonaka and Takeuchi 1995; Choo 2000; Von Krough, Ichijo and Nonaka 2000:6; Sallis and Jones 2002:10; Awad and Ghaziri 2004:47), or implicit (Frappaolo 2006:10). Explicit knowledge is that knowledge that is formal, codified and transferable from one person to another in a systematic manner (Nonaka and Takeuchi 1995:5-9; Choo 2000:396; Awad and Ghaziri 2004:47; Frappaolo 2006:10). Explicit knowledge is visible, shareable and communicable with others using symbols. It is also easy to manage and can be codified in computer systems (Sallis and Jones 2002:11), digitised in books and reports (Sallis and Jones 2002:10-12; Awad and Ghaziri 2004:47), databases (Sallis and Jones 2002:10-12), and spreadsheets, memos and training courses (Awad and Ghaziri 2004:47). Such knowledge is external, physical or recorded (Irick 2007).

Tacit knowledge is that knowledge which is uncoded, is invisible and subjective, and is hard to formalise (Nonaka and Takeuchi 1995:5-9). This knowledge is in-built in the daily activities of normal working (Probst, Raub and Romhardt 2000:143), is personal, interior to an individual and is based on experience (Choo 2000:395; Alavi and Leidner 2001:109; Irick 2007). It includes intuitions, beliefs and values, and is often embedded in people’s minds (Awad and Ghaziri 2004:47; Frappaolo 2006:10; Irick 2007). However, although some scholars have indicated that tacit knowledge cannot be codified, there is a school of thought that believes that some of the tacit knowledge can be harvested codified and shared, and this creates a third type of knowledge – the implicit knowledge (Frappaolo 2006:10-11). Tsoukas (2002) argued that tacit knowledge can be discussed, but could not be captured, translated, or converted.

Other typologies of knowledge include Boisot's (1998:59) classification, which advances four types of knowledge namely personal, proprietary, public knowledge and common sense; and Choo's (1998a; 2000:396) classification of tacit, explicit, and cultural (see also definition of key terms ). Kaniki's (2005) classification included expressed, unexpressed, and expressible. Cultural knowledge is founded on assumptions, beliefs and conventions held by an organisation that reflects their experience, beliefs, values, norms and reflections under its prevailing environment. Still, Hildreth, Wright and Kimble (1999) distinguished between hard and soft knowledge, and argued that hard knowledge is codifiable, while soft knowledge is embedded in daily work practices. Soft knowledge is hard to capture, codify and store, for example tacit knowledge. Soft knowledge is therefore eroded when an individual leaves an organisation and is irreplaceable. In addition, Alavi and Leidner (2001:111-112) posited that knowledge may be classified as: a state of mind, an object, a process, a condition of having access to information, or a capability. According to Alavi and Leidner (2001), an understanding of knowledge taxonomies can help the design of knowledge management systems. The role of agricultural information and knowledge in an AKIS is discussed in **section 4.4**, while the integration of local knowledge and external information is presented in **section 4.4.3**. Linked to the creation of new knowledge is the concept of innovation.

#### **4.1.6 Knowledge management**

Although several definitions for the concept of knowledge management have been advanced, the debate on what constitutes knowledge is still ongoing (Hildreth, Wright and Kimble 1999; Sallis and Jones 2002; Salisbury 2003) (see definition of key terms in the preliminary pages). However, knowledge management can be best described from the understanding of the concept knowledge (see **sections 4.1.5 and 3.2.1.2**) by linking knowledge management to the discussion on knowledge, it was noted that there was no consensus on what knowledge is. As an example, some authors maintained that knowledge was an aspect of people, hence could not be transferred (Röling 1988:47,48). Others considered it to be a process (flow of information) (Nonaka and Takeuchi 1995:58). Choo (2000:395) conceived knowledge to be an object and an outcome of interactions of people working together. A number of authors indicated that knowledge was an asset (Nonaka, Toyama and Konno 1998; Empsen 2001:812; Styhre 2003:21; Nonaka and Toyama (2005:429). Still others viewed it as "a thing" (Styhre 2002b:230,233), or both a thing and a process (Empsen 2001:814; Snowden 2002a). Stacy (2001:3) contended that "knowledge is not a 'thing' or a system, but an ephemeral active process of relating," while Wenger, McDermott and Snyder (2002:6) posited that knowledge was not a "thing" or an "object." This study is guided by Plato's (1953) view of knowledge as "justified true belief." In addition, DePaula and Fischer (2005) state that knowledge should not be viewed as a commodity to be consumed, but rather, should be designed and constructed in a collaborative manner, focusing on innovation, continuous learning and collaboration.

Von Krogh, Ichijo and Nonaka (2000:vii,7,54-55) shared the view that knowledge cannot be managed but rather, it can be enabled through creating shared space that fosters linkages and relationships. They argued that the creation of knowledge was dependent on the level of care provided to users, and the higher the level of care, the stronger the relationships. Adding to this debate, Wenger, McDermott and Snyder (2002:6) indicated that knowledge cannot be stored, owned and managed. They explained that useful knowledge resides in the skills, understanding and relationships, tools and processes of community members, hence it is a living practice that results from accumulated experience of knowledge communities (people's actions, thinking and conversations).

Knowledge management pertains to identifying knowledge and explaining it in a manner that can be easily and formally shared, and leveraging its value through using and reusing it (Turban *et al.* 2001:451). Such knowledge is captured in the institutional memories of groups or organisations (Cross and Baird 2000:69-70). To Rollet (2003:209), knowledge management was a “way of thinking” that drew from what had been neglected and would otherwise have been overlooked. Bergeron (2003:6,8) described knowledge management as the “ability to selectively capture, archive, and access the best practices of work-related knowledge and decision making from employees and managers for both individual and group behaviours.” It is a conscious and systematic approach and optimisation strategy that “selects, distils, stores, organises, packages and communicates information essential to the business.” Dalkir (2005:3), who emphasised the aspect of coordination, added the concept of technology and took into consideration that knowledge could be an attribute of an individual or group. Dalkir (2005:3) viewed knowledge management as “the deliberate and systematic coordination of an organization's people, technology, processes, and organizational structure in order to add value through reuse and innovation.” Thus, from a people-focused perspective, knowledge management is the “managing [of] people, what they know, their social interactions in performing tasks, their decision making, the way information flows and the enterprise's work culture” (Abdullah *et al.* 2006).

Knowledge management maximises the effectiveness of explicit and tacit knowledge as well as undocumented knowledge (IBM 2001), and as defined by Sallis and Jones (2002) and Abdullah *et al.* (2006) in definition of key terms in the preliminary pages), it is concerned with managing individual, group and organisational knowledge using technology where appropriate. At its root, knowledge management relates to managing people, the knowledge possessed by the people, the manner in which they interact socially as they perform their tasks, the way they carry out decision making, the way information flows and the work culture of the organisation or group. It is about open sharing of knowledge and facilitates the capturing and monitoring of intellectual capital as well as promoting its

leverage. Further, it relies on the resourcefulness of its assets and enables the taking of informed action (Frappaolo 2006:3,5,13,43). Understanding of the KIS guides interventions aimed at increasing the benefits of the system to different actors (Salomon and Engel 1997a:74). The interactions and relationships between actors in an AKIS facilitate the capturing, recording and sharing of knowledge and the unique knowledge assets held by the different actors form the fabric that holds the actors within the AKIS together (Malekmohammadi 2009:233).

Nevertheless, Sveiby (2001a) considered the choice of the term “knowledge management” to be a poor term that authors are stuck with, asserting that knowledge cannot be managed. Sveiby (2001b; 2001c) argued that knowledge management consists of the information technology track (knowledge as object), which he perceived to be information management and the people track (knowledge as processes), which he considered to be the management of people. Knowledge management is thus a strategic activity, which relates directly to learning and is useful for innovation (Snowden and Stanbridge 2004:141).

#### **4.1.7 Innovation**

The concept innovation egressed from processes of interactions and mutual learning among multiple interdependent actors within a virtual boundary that potentially form a “soft system” (Röling 1995; Röling and Jiggins 1998:304; KIT 2007b). Explaining this process, Engel (1997:14) used the metaphor “theatres” of innovation to emphasise concepts such as individual agency, growth, sense-making, diversity, multiplicity and interdependency. Engel (1997:14) viewed “theatres” as places where actions that were partly premeditated and partly improvised were performed by multiple stakeholders. Innovation is defined as a social construct that reflects the outcome of interactions of diverse actors (individual and organisational). It is seen as a product of networks that interact and yield new solutions to addressing social or economic dynamics (Salomon and Engel 1997a; Berdegué 2005:3-4). As defined by the Royal Tropical Institute (KIT) (2007a) in the definition of key terms in the preliminary pages, the main elements of innovation are experimentation and networking. As emphasised by Röling (2004:23), concerted action was the “key ingredient” and “the crucial dimension of innovation,” which egress from interaction among complementary actors and the iterative learning which takes place.

Innovation is thus “the creation of new knowledge and ideas to facilitate new business outcomes, aimed at improving internal ... processes and structures and to create market driven products and services” (Du Plessis 2007:21). Through interactions, the different actors faced individual and collective challenges, and learned from each other. Technology development, transfer and learning is therefore necessary and depends on the intelligence, creativity and competence of researchers, extensionists, farmers and other actors (Onduru *et al.* 2002). As noted by various authors (Röling and

Pretty 1997; Salomon and Engel 1997a; Worth 2006:184), innovation is a critical factor in the AKIS. Du Plessis (2007:20,25) also emphasised that innovation is dependent on the availability of knowledge, and pointed out that rapid innovation has led to new and improved technologies that were constantly evolving.

## **4.2 A brief historical background of AKIS**

The concept of AKIS was developed in the late 1980s by Niels Röling (Hall 2007:5). According to Röling (1988:34), the concept of AIS, the forerunner of AKIS was first used as an analytical tool by Uwe Nagel (1980), who based his work on Havelock's (1969) linkage model. The institutionalisation of the AIS by the University of Illinois led to the establishment of the International Programme for Agricultural Knowledge Systems (INTERPAKS), and the recognition of the concept (Swanson and Claar 1983 cited in Röling 1988:34). Among authors who used the concept earlier are Prof. Hugh Bunting in plant science (Röling 1988:34), Lionberger and Change (1970; 1981 cited in Röling 1988:34) in extension systems, and Albrecht (1982 cited in Röling 1988:34) in innovation model processes. The old conventional wisdom on technology development and transfer was based on the thinking that knowledge was created by research, and was transferred to farmers who utilised it through extension. However, this linear model was considered inadequate, as it did not cater for the less innovative farmers with limited resources who formed the majority of the rural population (Röling 1988:179). There was also emphasis on the need to take into consideration environmental, social and economic sustainability factors (Koutsouris 2008:204). The concept of AKIS was [further] developed by researchers at Wageningen Agricultural University in the late 1980s (Ramirez 1997; Röling 1988:108), and the concept of AKS commonly used in the 1990s (Röling and Jiggins 1998:304).

Efforts to modernise agriculture in most countries commenced with setting up stand alone research, extension and agricultural education institutions (Rivera, Qamar and Mwandemere 2005:4). This approach of operating independently led to poor linkages among the institutions and even weaker linkages with farmers. The knowledge triangle, implicit in the AKIS approach was thus adopted to promote efficiency and effectiveness, and facilitate the improvement of linkages between the sub-systems. The AKIS concept has contributed to the changing approaches to knowledge and information (Salomon and Engel 1997a:13). As discussed below under **section 4.5**, a diverse range of actors including farmers, extensionists, farmers' organisations and input suppliers have come into play. Indeed, as stated by Röling (1988:32), it is "unfruitful ... to look at extension in isolation from other sub-systems."

Röling (1988:32) considered research, extension and agricultural development to be central in agricultural innovation, and as key pillars of the policy instrument triad. He explained that to

improve extension, one needs to address research and the mechanisms linking the actors, including farmers. Research, extension, education and users (farmers) form a system that includes knowledge and information systems. The sub-systems need to address the manner in which people use different sources of information, how information is processed, how knowledge is used and the long-term effects of extension (Röling 1988:34). Policies of privatisation and liberalisation have led to the entry of new actors such as NGOs and the private sector, making it necessary to build new sustainable linkages and give new consideration to policies (Röling and Pretty 1997; Salomon and Engel 1997a:13). Engel (1997) thus suggested the need to empower people by applying multiple rationalities that facilitate adaptation to the dynamic environment through an interplay of relevant social actors.

Röling and Pretty (1997) advocated for the transformation of research and extension and pointed out that the nature of the local agricultural knowledge of rural people was not properly understood. Some considered such knowledge to be “primitive,” “unscientific,” or “overtaken by development” (Röling and Pretty 1997). For example, in Kenya, the early settlers looked down on local knowledge and branded such knowledge to be primitive and backward (Ibui 2007:4). There was thus a need for an approach that factored in the value of local agricultural knowledge into farming activities, and ensured local communities were “involved in active learning, in (re)inventing technologies, in adapting their farming systems and livelihood strategies” (Röling and Pretty 1997). Emphasis should thus be on social and human capital development and in promoting innovation at all levels (Lele *et al.* 2010:64), as opposed to the past, where policy making was considered a preserve of a selected few who formulated and imposed policies which often led to conflicting knowledge and concerns (Röling and Pretty 1997). These authors pointed out that the policy making process was a “negotiated agreement” where the central authority assumed a facilitating function, and different actors with varying views were involved. As aptly stated by Röling and Pretty (1997), “policy is only effective if it is based on a widely shared consensus.”

The soft systems approach that supports the viewing of wholes, recognises interrelationships, and how to effectively structure them and enable learning is important in the study of AKIS (Checkland 1988; 1999; 2000; Checkland and Scholes 1990; 1999) (see **section 3.2.1.1.2**). Through understanding an AKIS, knowledge and information can be effectively exchanged between actors, who work together, communicate with each other, share available knowledge and information resources, learn new practices and innovate to find solutions to complex social issues (Salomon and Engel 1997a). Röling and Jiggins (1998:283) acknowledged that ecologically sound agriculture is underpinned by an ecological knowledge system, which is created through policy, institutional and behavioural change. It is in this regard that the FAO and the World Bank added the term “information” to the earlier AKS concept. According to these organisations, knowledge was

generated, while information was transferred (Rivera, Qamar and Mwandemere 2005:12). Efforts have been made to popularise AKIS, and the concept has been adopted in many developed and developing countries (Röling 1988; Engel 1997; Salomon and Engel 1997a; Engel and Salomon 1997; FAO and The World Bank 2000) (see **section 4.6**). The concept of AKIS was articulated in the late 1990s and a strategic vision and guiding principles document was developed by FAO and The World Bank (2000). As pointed out by Rivera, Qamar and Mwandemere (2005:12), AKIS was launched at a time when there were dynamic changes and reforms worldwide.

### **4.3 Relationship between knowledge management and AKIS**

There are diverse actors (individuals, groups, networks and institutions) that play complementary roles in an AKIS (Röling 1988; Engel 1997:40; Salomon and Engel 1997a; Engel and Salomon 1997; FAO and The World Bank 2000). Knowledge management brings together the different elements of the system, and provides an understanding of the functions of the system (Röling 1989:69).

Knowledge management, therefore, facilitates the management of interfaces, resources and power of actors (Asopa and Beye 1997b), where the “whole” is better equipped at handling different types and sources of knowledge and information (Engel 1997:40). AKISs are location specific, hence they make communication possible (Asopa and Beye 1997b). According to Asopa and Beye (1997b), linkages require “similarities in culture, language, socio-economic status of the personnel,” which along with knowledge management, was crucial for the effective running of an AKIS (Asopa and Beye 1997b). In fact, the principles and concepts of the AKIS discussed in **section 4.1** bear fruit through the management of the AKIS. Engel (1997:40) however pointed out that there are varied views among social actors, and while separate sub units may have unified management, in some cases their missions may be contradictory or even conflicting. Engel (1997:40) suggested the need for “knowledge management,” to facilitate innovation and social learning that integrates the efforts of individuals to achieve joint performance. This facilitation calls for the interaction of different individuals at individual, network, organisation and theatre levels.

Knowledge management helps individuals to make better decisions and solve problems. Further, knowledge management facilitates an effective management information system (MIS), well managed resource flows, a sound understanding of the whole system, and a good understanding of the roles of the sub-systems within the system. In short, knowledge management calls for a well balanced management of the interfaces and power of the various actors. For Dalkir (2005:20), knowledge management facilitates CoPs to develop community and networking skills, share best practices and build organisational memories. It can be said that knowledge management is in harmony with AKIS (Asopa and Beye 1997b). As concluded by Malekmohammadi (2009:233), an AKIS, as a system for improvement in agricultural development, depends on “the management power of each farmer and ... it is indispensable to implement knowledge management in order to



acquire competitive advantages in agriculture as effective ways to increase the values of the sector as well as ...[the] actors.”

#### **4.4 The role of knowledge and information in AKIS**

Alex *et al.* (2002:1) pointed out that agriculture is approaching the limits of available natural resources and that intensification and not the exploitation of natural resources will drive future increases in agricultural production. According to Alex *et al.* (2002), sustainable intensification will require knowledge, “information, skills, technologies, and attitudes.” For the technologies to provide new opportunities, farmers need to access information and knowledge. Local knowledge and external information are considered important because they form the bedrock of society and facilitate communication and decision making (Warren, Sikkerveer and Brokensha 1995:xii,xv; Emery 2000:23; Millar 2004; Saway 2004:10); problem solving (Warren 1991; Kaniki and Mphahlele 2002:2); and understanding (Maruthi and Srinivas 2006:3). In other words, knowledge gained more value when it was shared (Skyrme 1999). As observed by Frankfort-Nachmias and Nachmias (1996:3), there was increased recognition of the central role that knowledge and information play, and people have acquired knowledge in different ways in order to understand themselves and their environment. A wide range of stakeholders need to share knowledge and information to ensure effective decision making (Cooper and Denning 2000).

Choo 2000:397) observed that people’s heads are repositories of accumulated knowledge in the form of facts, events and procedures, and this tacit knowledge enables people to work and make sense of what was happening around them. Knowledge and information not only empower communities to participate in decision making and to exchange ideas with others (Harris 2002), but are essential in rural development (Garforth, Khatiwada and Campbell 2003:1). Local knowledge in particular provides ideas and guidance on necessary agricultural changes (Garforth, Khatiwada and Campbell 2003:1). As noted by Emery (2000:23), local knowledge is being used by local communities, who are gradually being involved in their own development and in decision making. Scholars have also pointed out that local and external information, knowledge and technologies are vital for improving livelihoods and economies (Pretty and Wesseler 2004:9). To facilitate the objective of an AKIS of increasing agricultural productivity, the diverse actors have access to both traditional and modern sources of information and knowledge from farmers, research, extension, education and the private sector (Adedipe, Okuneye and Ayinde 2004; Rivera, Qamar and Mwandemere 2005:v,2,9). Indeed it has been observed that where there was a lack of knowledge on modern agricultural practices among some small-scale farmers, it was necessary to train and “push” information to farmers because they may not be aware of the new practices (Meyer 2000:214).

A body of literature suggests that knowledge and information continue to be underutilised (Abbott 1989:2; Buchanan-Smith, Davis and Petty 1994; Aina, Kaniki and Ojiambo 1995; Rosenberg 1995; IIRR 1996; Meyer 2000:209,214; Adomi, Ogbomo and Inoni 2003; Harris 2004), and most African governments pay little attention to the provision of agricultural information (Aina, Kaniki and Ojiambo 1995:vii). In contrast, developed countries accord much importance and priority to information (Powell 2003:7). Kalusopa (2005) cautioned that assessing the value of knowledge and information in improving decision making is not a simplistic activity. Kalusopa (2005) argued that there was a need to understand the ecology of knowledge and information within a given community, to establish who the generators of knowledge and information were and who the users of knowledge and information were. In addition, it was crucial to understand the knowledge and information needs of small-scale farmers and the usage of knowledge and information. The present study addressed the roles of local and external knowledge in an AKIS, and was designed to understand the ecology and integration of knowledge and information among small-scale farmers in Kirinyaga.

#### **4.4.1 Knowledge in AKIS**

Knowledge is a vital resource that can be managed for the improvement of agriculture (Engel 1997:9; Salomon and Engel 1997a:9). Knowledge and skills are essential resources for farming and studies on ways in which farmers obtain and share knowledge are invaluable to farming systems research and extension, and in informing policy (ETC East Africa 2000). The World Bank (1998) likened knowledge to light and argued that it was weightless and intangible yet it travelled easily round the world and enlightened people. Knowledge was deemed to be the most important factor influencing livelihoods, by bringing to light preferences, informing markets and illuminating economic transactions (The World Bank 1998). It has been described as a primary source of competitive advantage (Zack 1999; von Krogh, Ichijo and Nonaka 2000; Awad and Ghaziri 2004), as a “catalyst for development” (Chapman and Slaymaker 2002:27), an accelerator of development and as a resource for addressing poverty (Mchombu 2007).

Ferreira and Neto (2005:4) viewed knowledge as a public good associated with value and wealth. They contended that knowledge should be optimised through sharing, using and growing of more knowledge. Awad and Ghaziri (2004) shared similar views and considered knowledge to be social and not private. Once knowledge was relayed to others, it became part of the “real-life experience” of the person sharing it (Awad and Ghaziri 2004). These assertions explain why knowledge is perceived to be the most valuable asset in today’s world (Oettie and Koelle 2003:9), and the ingredient that guides action<sup>29</sup> towards sustainable development (Van Kerkhoff and Lebel 2006). A review by Van Kerkhoff and Lebel (2006) showed that research-based knowledge from coalitions of actors including

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<sup>29</sup> Action refers to “doing something that has physical or behavioral repercussions” such as changing practices, policies and regulations (Van Kerkhoff and Lebel 2006:448).

researchers and practitioners was linked with actions. In line with this argument, Jones (2006) emphasised that increases in agricultural production come from the application of new knowledge and innovations.

Koutsouris and Papadopoulos (1989:89) asserted that local knowledge was a requirement to understanding the complex farming systems of small-scale farmers. Although rural people's knowledge was in the past perceived to be primitive, unscientific and wrong Scoones and Thompson (1993:2) and Warren (1991) argued that local knowledge was necessary for solving local problems. Supporting this argument, Oettie and Koelle (2003:9) pointed out that rural communities have a great strength – their local knowledge and “know how” about medicinal plants, environmental management and sustainable traditional agricultural practices. As observed by Hoffmann, Probst and Christinck (2007:356) “farmers have been developing agricultural practices and innovations without the contributions of modern science.” It is indeed acknowledged that farmers' local knowledge was gaining importance (Warren 1991; de Villiers 1996; IIRR 1996; Von Liebenstein 2000:9; Ngulube 2002; Dinucci and Fre 2003:iv; McDowell 2004). More recently, The World Bank (2010a:17) pointed out some good practices such as zero tillage and biochar<sup>30</sup>, which were beneficial to farmers and the environment that tapped on both local knowledge and external information.

Kaniki and Mphahlele (2002:4) posited that local knowledge is unique to a given culture or society and is based on innovation and practical experimentation. Various authors (The World Bank 1998:8; Koskinen 2003; Sen 2005:375; Waters-Bayer and Van Veldhuizen 2005:4; GebreMichael 2006:1; Jain 2006:62; Nwokeabi 2006:1; Ibui 2007:261; Kohlbacher and Krähe 2007; Mchombu 2007:39) have shown that the culture of a community determines how local knowledge was shared and how it was communicated (Styhre 2003:149). Mchombu (2007:39), explained that local knowledge “is part of the culture and heritage of the community. Tapping into local people's knowledge could thus ensure success in development (Brokensha, Warren and Werner 1980:7-8). As pointed out by Millar (2004), despite the many generations of colonial influence in Africa, decisions about agriculture, natural resources management (NRM) and health in Africa are heavily dependent on local traditions and cultures. This knowledge is passed on to younger generations by earlier generations, to guide decision making, problem solving, innovation and understanding (IIRR 1996:3; Ngulube 2002; Stefano *et al.* 2005b). Nevertheless, Briggs (2005) contended that as a unitary knowledge, local knowledge had not quite attained the social and economic progress it was expected to attain among peasants and small-scale farmers.

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<sup>30</sup> Biochar is a soil-enriching product prepared by burning wet biomass (crop residues) or manure under conditions where there is no oxygen. The product is a charcoal like solid that has high carbon content (World Bank 2010:17).

Skyrme (1999) asserted that knowledge gains more value when it is shared. Equally, rural communities have emphasised that “it is very important to have that information that you know but you have to share it with others” to enrich them (Leach 2001a:57). Probst, Raub and Romhardt (1999) also acknowledged that the sharing of local knowledge was crucial in ensuring survival and competitiveness. In this regard, traditional societies have nurtured their own knowledge systems in diverse spheres such as botany, meteorology, health and agriculture (Von Liebenstein 2000:2), and communities have used this knowledge for decision making on food security, human and animal health, education and natural resources management (Gorjestani 2000).

#### **4.4.2 Information in AKIS**

It is widely acknowledged that information is a vital resource (Rosenberg 2001:11), and that we live in the information age (Torero and von Braun 2006:1). The importance of information in improving rural livelihoods and in rural development is well documented (Mchombu 1993; Aina, Kaniki and Ojiambo 1995:vii; Rosenberg 2001; Meyer 2005; Kapange 2006; Matovelo, Msuya and De Smet 2006). Information is critical to development and is needed by all categories of users including farmers, policy makers and planners, researchers, extensionists, educators and agro-processors (Aina 1995:1). This observation was shared by Adimorah (1995:21), who noted that rural communities in Africa need information for development. All human activity requires information, which is a precursor to problem solving (Abid 1995:11; Meyer 2005), decision making (Aina 1995:1; Harris 2002; Garforth *et al.* 2003:2) and the attainment of rural policy objectives (Garforth *et al.* 2003:2). On the other hand, Ballantyne (2005) pointed out that information opens up opportunities and helps shape the lives of rural people. Further, Mchombu and Cadbury (2006:6) asserted that people could better tackle problems, adopt new ideas and introduce social change if they had access to information that was relevant to their needs.

Some authors have observed that external technical information is only a small fraction of the messages farmers receive through traditional communication channels (Mundy and Compton 1995). A study by Hoffmann, Probst and Christinck (2007:359) suggested that farmers considered information from external information providers to be more risky than that which they obtained from fellow farmers. Nevertheless, Choo (1998) pointed out that it is important to assimilate and exploit external information to create new knowledge. Supporting this point, DePaula and Fischer (2005:22,24) noted that “learning from the past” was inadequate because knowledge was created collaboratively through innovation and learning as opposed to a consumable commodity. There was thus a need to focus on communities, collaboration, networks and communication. Comprehensive agricultural information, including physical and marketing conditions, production, credit or equipment for small-scale farmers is thus considered a prerequisite for planning and policy (South Africa. Department of Agriculture 1995:18-9). Machuka (2001:16) also emphasised that it is “crucial

that scientific information reaches farmers in the rural areas who have space to practice farming and ... other actors such as agricultural scientists and extensionists who interact with farmers.” In fact, Meyer (2003) described information as one of the most valuable resources in rural development.

Nevertheless, research has shown that farmers lack up-to-date market information and traders lack information on daily market conditions (Collinson *et al.* 2003:27). Findings by Matovelo, Msuya and De Smet (2006) supported this finding and pointed out that most farmers desire to have information on different agricultural innovations in order to improve their farming practices. Scholars have demonstrated successful results in information initiatives where different actors (farmers, researchers, extensionists and educationists) have collaborated in the sharing of local knowledge and external information, repackaging local content to meet the needs of farmers (Mundy and Sultan 2001; Munyua and Adupa 2002; International Development Research Centre (IDRC) 2004). A number of authors have stressed the need for combining local and external information (Meyer 2000; Garforth, Khatiwada and Campbell 2003; Meyer and Boon 2003).

Although it is believed that timely information helps to avert disasters such as droughts, floods and famines, a study conducted in five African countries suggested that information was often left on the periphery of most decision making processes (Buchanan-Smith, Davis and Petty 1994). According to Buchanan-Smith, Davis and Petty (1994), the main cause for failing to prevent natural disasters, including famine, was insufficient information.

#### **4.4.3 Integrating local and external information and knowledge in an AKIS**

There has been wide interest globally in integrating traditional and scientific knowledge systems (IIRR 1996:3; Meyer 2000; ICSU 2002:13; Agrawal 2004). Agrawal (2004) observed that technical solutions of past decades had not realised the expected results of improved livelihoods for most small-scale farmers and peasants, and there was now a shift to local knowledge. According to Rajasekaran, Martin and Warren (1993), the mixing of external and local knowledge improved communication, understanding of the views of the local community and increased participation of the local people in their development. Mundy and Compton (1995:139) pointed out that the knowledge of farmers was useful in identifying research issues (research priority setting) and the generation of technology. Communities have learned how to grow food, maintain their environment and survive under conditions of hardship over the years (IIRR 1996:3; Ismail and Fakir 2004:173), and their local knowledge has helped researchers to learn and understand the “farmer science” (Castillo’s 1998:204-205). For instance, Nwokeabia (2006:1) noted that farmers had developed unique local agricultural innovations and discoveries on breeding, grafting, pest management, water harvesting and processing. In this regard, the IIRR (1996:3) emphasised the need for integrating farmers’ local knowledge and external information systems in order to improve agricultural production and

livelihoods. It has been noted that inclusion of local knowledge improves linkages between actors, and improves sustainability (Emery 2000:21). The integration of local and external knowledge has been observed in FFSs, which take cognisance of the farmers' expert knowledge and external knowledge (Onduru *et al.* 2002; Rangi *et al.* 2002:6-7).

Many studies have shown that cross-cultural approaches to present the world in two perspectives –the western science world view and from the local community world view, changes the social power relationships so that knowledge flowed from two cultures that were equally important (IIRR 1996:3; Röling and Pretty 1997; Meyer 2000; 2003b; 2005; 2009; Saha *et al.* 2006:7; Maponya and Ngulube 2007:81-82; Nathan, Lund and Theilade 2007:4; Mairura *et al.* 2008:85; Mihale *et al.* 2009:253). Mchombu (2003) and Meyer (2000; 2003; 2005) further demonstrated the impact of agricultural knowledge and information in improving agricultural productivity and livelihoods. As an example, findings of the Phokoane community study in South Africa, that used training to transfer information on improved maize technologies and modern farming practices, revealed that the information from outside complemented the local knowledge the farmers had. Farmers who applied external information or modern farming harvested a bumper crop. This transformation underscored the value of merging external and local information as a resource for improving rural livelihoods (Nathan, Lund and Theilade 2007:4). As pointed out by Meyer (2003), research in the integration of local and external agricultural knowledge was fairly limited and she suggested the need for further research on integrating local and external knowledge. Adedipe, Okuneye and Ayinde (2004) in Nigeria showed that the use of local knowledge reduced the effects of the negative impact on the environment.

Other authors have shown that combining local and external knowledge led to improved linkages (Emery 2000:21); increased yields (Garforth 2001c; Adedipe, Okuneye and Ayinde 2004); helped to conserve the environment (Hemp 2005:204; Eklund 2009:13); helped in making land management decisions (Lewis 2008:300,301); added value to local knowledge (Lwoga and Ngulube 2008); helped to manage risk (Eklund 2009:13); promoted acceptability and sustainability of both knowledge systems (Breidlid 2009:147); and reduced production costs (Mihale *et al.* 2009:253). However, some authors have observed that in some cases the results of external or local knowledge were not satisfactory (Turnbull 1997:559; Briggs 2005:3,14). To contribute to these efforts, the present study investigated the role of local and external agricultural information among small-scale farmers in Kirinyaga district.

#### **4.5 The key actors in AKIS and their roles**

Röling (1988) emphasised the importance the different actors (individuals, institutions, organisations, groups and networks) play in an AKIS. Various authors have recognised that the different stakeholders including the researchers, extensionists, educationists, CSOs and farmers who set the

scene in the agricultural sector played specific roles in an AKIS (South Africa. Department of Agriculture 1995; Engel 1997; Salomon and Engel 1997a; Pretty and Vodouhe 1997; RoK. Ministry of Finance and Planning 2002a; RoK. Ministry of Agriculture 2006). In addition, the actors have unique knowledge assets, hence need to learn from each other (Pretty and Vodouhe 1997). The coming together of different stakeholders to exploit opportunities promotes ownership (Pretty and Vodouhe 1997:47), and facilitates innovation (Engel 1997; Engel and Salomon 1997; FAO and The World Bank 2000). However, as noted by various authors, (FAO and The World Bank 2000; Garforth 2001a; 2001b; RoK 2005a:2), linkages between research, extension, CSOs and farmers were weak and inefficient, and often the technologies did not reach their intended beneficiaries. Lessons drawn from the African Highlands Initiative (AHI) suggested that there was a need for broader participation of partners from a diverse range of organisations (Stroud and Hagmann 2006).

Sharing the findings of the vignettes from Turkey, Röling (1988:18) concluded that people's participation was crucial in making development work successful because it provided the "motivation, understanding, self-interest, commitment and organisation" of people. Participation uses the knowledge, value and beliefs of diverse individuals, groups and organisations, as well as their skills and talents to address community needs (Colle and Roman 2003:21). Röling and Pretty (1997) made special mention of the role of local people and pointed out that they were continually learning, innovating and adapting their farming practices. They argued that technology development processes should involve farmers and emphasised the need for the actors to listen to each other. Educational institutions are, therefore, not the only custodians of knowledge, but rather, knowledge results from the cooperation of the different actors learning from each other.

For Eicher (1999:33), the key pillars of the agricultural knowledge triangle comprised research, extension and higher education. In addition to these pillars or sub-systems, Salomon and Engel (1997a:17) and Rees *et al.* (2000) recognised farmers, input and service providers, policy makers, agro-processors and traders among others. Various other studies have identified more actors including intermediaries (NGOs), producer organisations, and the private sector (Bertolini 2004; Rivera, Qamar and Mwandemere 2005:5), and media (Rivera, Qamar and Mwandemere 2005:vi,38,49). Rivera, Qamar and Mwandemere (2005) emphasised that actors should strengthen their linkage mechanisms and develop active partnerships with farmers to improve the flow of technology and information. In addition, Del Castello and Braun (2006:2) identified informal leaders, community workers and businesspersons as key actors in the AKIS. The following section discusses the key actors and their role in an AKIS.

#### 4.5.1 The government and public sector

The government and public sector were identified as key actors in the AKIS (Chamala and Shingi 1997; Rivera and Alex 2004:41; Spielman 2005:13; De Haen, Henne and Stoyke 2007:7,11). Respondents of a study by Rees *et al.* (2000:1) in Kenya indicated that between 40 and 70% considered government extension to be a key source of agricultural information. As pointed out by the FAO and The World Bank (2000:9), the role of government had been redefined to focus on policy and regulatory activities and services that the government was best placed to offer. This finding was in line with a key lesson learned from the Rivera, Qamar and Mwandemere's (2005:49) AKIS case studies in ten countries, which emphasised that national governments had the power and special influence to take forward responsibilities that affected the whole country.

However, the interventions by the public sector were constrained when some of the formerly free government services (for example research and extension delivery) were privatised (Umali and Schwartz 1994:15; Alex *et al.* 2002:2,10). These authors argued that the government needed to focus on the provision of public goods and services including policy development and reforms that ensured equitable and demand-driven services that responded to the needs of farmers. In addition, they argued that the public sector had a role to play in collaborating with NGOs and other actors through participatory extension, to exploit new technologies and scale up the farmer empowerment NGO models (Alex *et al.* 2002:17). As pointed out by Umali and Schwartz (1994:15), while public extension focused more on efficiency considerations and social objectives, the driving force of private extension services was economic returns.

Nevertheless, the findings of the Rivera and Alex (2004:41-43,49) study cautioned that although contemporary thinking downplayed the role of the public sector, there were certain agricultural extension and rural development functions that could only be assumed efficiently and effectively by the public sector. For example, the collection and provision of information which is an important prerequisite of policy formulation, good governance and market development. To quote Rivera and Alex (2004), "only governments can create the conditions necessary for developing AKIS/RD." In the context of Kenya, the government extension services have played a key role in disseminating agricultural technologies and information. Programmes such as the NALEP which was implemented by the Ministry of Agriculture and Livestock Development used participatory approaches to pass information to farmers' groups through meetings, training, meetings, demonstrations and FFS (Noordin *et al.* 2001:516), and provide agricultural information to farmers nationally through NAFIS – a national information service for farmers (see **sections 2.2.4.2 and 2.2.4.3**). In sum, the public sector played a key role in providing agricultural knowledge and information in the public domain (Spielman 2005:13), and was complemented by the private sector



actors, who provided agricultural knowledge and information to farmers from the private domain (Petersen 1997) and NGOs (Rivera and Alex 2004:41-42).

#### **4.5.2 Extension**

Extension has been defined as a two-way process involving adult learning, with the aim of changing attitudes and skills of farmers and extension workers (Chepsaigutt 1997:248). Extension has its origins in education development in the (UK), where Oxford and Cambridge universities provided extension services that addressed the needs of the surrounding populations in both the industrial and rural areas (Jones and Garforth 1997). As pointed out by Foti *et al.* (2007:28), extension is responsible for transferring improved technologies and agricultural information to enhance the productive capacity of farmers, and has served as the link between farmers to transfer best practices from one farmer to another. In agreement, Alex *et al.* (2002:4) added that extension is a rural KIS that informs and influences the decisions of rural households. Extension thus has the role of facilitating learning, decision making and reflective action (Rivera and Sulaiman 2010:65).

It is widely recognised that extension services in developing countries are weak, constrained, ineffective and under pressure (Noordin *et al.* 2001:510; Rivera, Qamar and Crowder 2001:15; Alex *et al.* 2002:4,5; IFAD 2002a; Chapman *et al.* 2003:2-3; Madukwe 2006; Worth 2006:180; Swanson 2008). Authors have observed that extension has been changing over time and has become a part of knowledge and information systems in a social system (Röling 1988:22,34; Foti *et al.* 2007:28). Anderson and Feder (2004:42,46,55) also noted that links between extension and knowledge generation institutions and extension and research were weak, and acknowledged that public extension was not necessarily the most efficient source of information. In addition, case studies on AKIS in developing countries revealed that there was a need to establish strong linkages between extension with agricultural universities, colleges and training institutions, ministries and departments, and the private sector (Rivera, Qamar and Mwandemere 2005:54-55).

Umali and Schwartz (1994:8) and Rivera and Alex (2004:41-42) observed that modern extension has become a pluralistic system and was a function of both public and private agencies and institutions that provided knowledge and information services, such as NGOs, universities, research institutions and farmer associations and groups. In some countries, extension services have either been downsized or phased out altogether (Tire 2006:35; The World Bank 2006a). Extension services were equally a challenge in the context of developed countries (Thomson *et al.* 2006). A USA study on the local food systems (LFS) to support farmers to produce, process, and distribute locally and at regional level showed that the LFS faced barriers in communications and understanding of the food system, and identified the need to respond to community-identified needs. In addition, The World Bank (2010a:18) noted that extension services faced many constraints including insufficient resources and

staff, who were agronomists and engineers but did not have training in communication. These inefficient interventions by the public sector paved way to the emergence of private extension services alternatives (Umali and Schwartz 1994:15; Alex *et al.* 2002:2,10; Rivera and Sulaiman 2009:267; 2010:65).

Focusing on the context of Kenya, Oggema (1997:1) observed that in the past, technology development and dissemination were top-down and the technologies generated were ineffective and inefficient in solving farmers problems. Sharing this observation, Ochieng (1997:1) noted that farmers were not taking up new technologies and argued that the questions of the 1960s regarding whether the technologies developed and disseminated were appropriate and relevant to farmers' circumstances were still relevant. Many authors have further observed that adoption of improved technologies in Kenya remained low (Curry, Kooijman and Recke 1998:5; Kimenye 1998:201,210; Franzel *et al.* 2004; Kiptot *et al.* 2007:515). This was despite the Memorandum of Understanding (MoU) signed in 1991 between the KARI and the Ministry of Agriculture and Livestock Development and Marketing in Kenya to bring scientists and extension closer together in providing a better understanding of the problems and activities of small-scale farmers (Ochieng 1997:1). As presented in **section 2.2.4.2**, the government extension services are the main method of disseminating agricultural technologies in Kenya, but Noordin *et al.* (2001:510) observed that little impact had been realised. Even the World Bank supported T&V model that was used in many countries (including Kenya) was considered ineffective and unsustainable (Chepsaigutt 1997:248; Röling and Pretty 1997; Salomon and Engel 1997a:13; Reij and Waters-Bayer 2001a:3; Kiptot *et al.* 2006). Generally, extension services based on the linear model were unsatisfactory in sharing and disseminating outputs to small-scale farmers (Rees *et al.* 2000:10; Madukwe 2006; Richardson 2006). Nevertheless, there had been efforts directed at developing alternative extension approaches, which have led to more inclusive methods and according to Rivera and Alex (2004:41-43,49), the public sector was the organ that had the clout to “create the conditions necessary for developing AKIS/RD [Rural Development].”

Various authors (Chepsaigutt 1997:248; Eicher 1999:28; Franzel, Cooper and Denning 2001; Madukwe 2006) have noted the improvements in extension services such as the adoption of pluralistic methods that entail the participation of other actors in addition to extensionists. Röling and Pretty (1997) observed, “farmers were clearly making their own adaptations according to their own needs.” These observations called for a change in the normal modes of research and extension approaches. Participatory decision making and openness was considered essential to adjusting to the challenges in the agricultural sector such as policy changes and extension reforms, and this recognition led to the adoption of a “bottom-up” approach that governments and development agencies used to ensure ownership of development by communities (Oettie and Koelle 2003:9).

Salomon and Engel (1997a) suggested group approaches - “extension as facilitating networking for innovation,” which included the dissemination and use of potential innovations. With this approach, the groups act as ‘institutions’ that influence the actions of farmers, their interactions, negotiations and decisions.

Some authors have suggested the participatory technology development (PTD) approaches that combine the knowledge and research capabilities of farmers and researchers at varying levels of control (Röling and Pretty 1997), and social interaction approaches that facilitate multiple and reciprocal communication and action (Salomon and Engel 1997a:9). Reij and Waters-Bayer (2001a:5,11) demonstrated that PTD had reaped the benefits of collaboration in terms of stimulating innovative capacities and knowledge and skills of farmers, researchers and extensionists. Farmer-led experimentation initiatives have been initiated among communities to strengthen the capacity of farmers to seek and test new ideas that are appropriate for their circumstances. The PFI programme is another example of a hybrid extension model that has helped to formulate new research methodology that promotes partnerships between governmental and non-governmental agencies with a focus on farmer innovation. This programme began in 1997 in Kenya, Tanzania and Uganda, and is based on “learning by doing.” The PFI empowers farmer innovators and consists of tailored training along with fieldwork and sharing of ideas (Critchley and Nyagah 2000:25).

The participatory extension approach views “change agents” as facilitators who help farmers to develop skills in analysing, solving and managing problems (Alex *et al.* 2002:17). Facilitation is important, and as demonstrated by the study on the Mlazi River Catchment Programme in South Africa, “facilitation at the local level is far more likely to produce real progress” (Engel and Salomon 2003:12). Madukwe (2006) observed that newer extension models and approaches have been developed based on farmer groups to ensure technologies developed reached the farmers they were intended for. The groups act as institutions that influence the actions of farmers, their interactions, negotiations and decisions. Other group approaches include the National Agricultural Advisory Services Programme (NAADS) in Uganda, which is empowering farmers to access privatised agricultural advisory services and technologies, introducing new enterprises, and providing information and market linkages (Mubangizi, Mangheni and Garforth 2004; NAADS 2006).

The NALEP programme also supports the group approach, which facilitates the exchange of information and knowledge to farmers through extension services (see **section 2.2.4.2**). There has also been increasing interest in scaling up<sup>31</sup> of interventions and innovations that were more

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<sup>31</sup> Scaling up was defined as efforts to “bring more quality benefits to more people over a wider geographical area more quickly” (IIRR 2000). It refers to an integrated approach (collective decision making) that harnesses the benefits accrued through the sharing of interventions or innovations to bring benefits to more people, more rapidly in a more equitable and sustainable manner (Menter *et al.* 2004:10). It means awareness

knowledge and management intensive (Cooper and Denning 2000; Franzel, Cooper and Denning 2001:524; Noordin *et al.* 2001; Menter *et al.* 2004; Franzel *et al.* 2004). Kenya has made reforms in research and extension aimed at strengthening the link between farmers' demands and supply of improved technology and advice (The World Bank 2004c:11). Policy and institutional reforms have also been made on selected commodities, and these have increased competitiveness on international markets (Kamau, Kiome and Wamuongo 2000:547; The World Bank 2004c:11; RoK. Ministry of Agriculture 2006:2; KARI. ATIRI 2007) (see **section 2.2.6**). FFSs shared what they learned through group training, or observed with other group members and members of the community (Williamson *et al.* 2003:191-193).

A case study to assess the training of trainers (ToT) model using hybrid maize in Tetu division of Nyeri district in Kenya revealed that the less innovative or “forgotten farmers” could be effectively reached through the targeting of agricultural information systems because the ToT model had allowed the farmers to create the necessary adoption conditions (Röling 1988:141). In short, newer programmes were focusing on developing the capacity of farmers to develop home-made solutions, making “new things visible” and involving farmers more in research, using local agricultural knowledge, and facilitating learning (Röling and Pretty 1997). Scholars also emphasised that it was necessary to “build on traditional communication systems and involve farmers” in the extension process. The community-based approach replaced the T&V approach in Kenya, and the introduction of group approaches had resulted in improved communication between farmers and extensionists, with the better uptake of new technologies in various countries including Kenya (Röling and Pretty 1997).

The group approach was tried out in addressing soil and water conservation under the Ministry of Agriculture in Kenya, where it proved to be a great success. This led to the rollout of the approach in other areas (Röling and Pretty 1997). Farmers' groups have increased efficiency and effectiveness, and increased farmers' participation in decision making (Mulaa *et al.* 1999:27; Tchawa, Jean-Baptiste and Bonneau 2001:25; Meyer 2000:154; Onduru *et al.* 2002), promoted farmer ownership of the research (Rees *et al.* 1999a:6), and helped the sharing of knowledge and interests (LEISA 2007:4). Linked to the group approach, is the “village committee approach,” which has been used to disseminate agroforestry information in Western Kenya. Under this approach, the researchers work with representative farmers belonging to existing village committee structures (Noordin *et al.* 2001:512). The FFS approach, which was developed by FAO in 1989 has been used very successfully

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creation, training of farmers and encouraging community participation (Noordin *et al.* 2001:521), and entails institutional capacity building to promote and sustain technology adoption in the community (Franzel, Cooper and Denning 2001).

to train farmers in developing countries. The FFS approach was introduced in Kenya in 1995, where it has been highly adopted. There are more than 2,500 groups in different ecological zones in the country (Groeneweg *et al.* 2006:1).

The FFS approach is based on non-formal adult education principles and methods and comprises groups of farmers who meet from time to time to address new production options, share knowledge and information and train others (Noordin *et al.* 2001:516; Groeneweg *et al.* 2006:2-5). The approach is grounded on the assumption that farmers have a wealth of experience and knowledge and for technology to work in a new location, farmers need to try it out, validate and adapt it in collaboration with technical input or experts. The FFS's bottom line is empowering farmers through education to handle their own on-farm decisions (IFAD 2002b:83), and develop the skills of farmers to adapt to their circumstances (Madukwe 2006). Indeed Braun *et al.* (2007:18) and Duveskog and Friis-Hansen (2009:240) attributed the success of the FFS to the direct involvement of farmers in identifying their problems, selecting, testing and evaluating possible solutions. However, Madukwe (2006) observed that a key challenge of FFS is that it relies on external funding, making sustainability a major issue. Other group approaches that have been tried out in Kenya include the PFI-FFS (Critchley and Nyagah 2000:25; Duveskog, Mburu and Critchley 2002), which is a development on the FFS, and the LLL, which promoted the sharing and exchange of information through integrated ICTs (Chapman and Slaymaker 2002:25; Braun *et al.* 2007:19). The LEISA organisation (2007) also concurred with the group approach and pointed out that globally, small-scale farmers have organised themselves into formal and informal groups such as FFS, farmers organisations, unions, cooperatives, alliances, networks, associations, voluntary self help groups and women's groups. Many deficiencies of the old extension services had been addressed, and modern extension services and the pluralistic approach promoted innovation, reforms and the formation and participation of other actors such as NGOs, the private sector and farmers' groups (Lele *et al.* 2010:64).

#### **4.5.3 Research**

Agricultural researchers (research institutes, universities, NGOs, private companies and farmers) are engaged in developing technologies, finding new ways of improving agricultural production and the value of agricultural products. Research helps to solve specific scientific problems, and provides policy makers with methods and tools that help to formulate policies. Further, research provides assessments of farming practices and policies and points out necessary reforms. Making their contribution, Röling and Wagemakers (1998:10) indicated that farmers were expected to become "experts" in external wisdom and technologies and were not just adopters of technology. They made the point that farmers needed to adapt the new practices to suit their local situation. This implies that farmers too need to experiment. This point was supported by literature reviews, which pointed out

that farmers, have been experimenting and innovating on the farms for many years (Alders *et al.* 1993; Shrestha 1996; Worth 2002).

In the context of AKIS, research needs to provide support to, and cooperate with other actors including farmers, policy makers, the private sector and NGOs (Rivera, Qamar and Mwandemere 2005:52-53). Although research has been conducted and many new improved technologies have been developed, linkages between research, extension, CSOs and farmers have been weak and often, these technologies have not reached or been adopted by their intended beneficiaries (Alemna 1995:69; FAO and The World Bank 2000; Rees *et al.* 2000; Baker *et al.* 2001). Alemna (1995:69) observed that farmers need to adopt high-yielding technologies, but as pointed out by various authors (Baker *et al.* 2001; Duram and Larson (2001:92; Röling *et al.* 2004:213), there was no synchrony between the focus of research and the needs of small-scale farmers. In other words, the assumption by researchers that they understood farmers' problems was misconstrued (Ndiaye 1995:115; Jones 2006), and was the cause of the development of technologies considered inappropriate by farmers. A study by Kamau (2007:144,207) found that although there were farmer-research groups, which demonstrated synergy through research linkages between KARI, the Ministry of Agriculture and farmers' groups, participation with small-scale farmers was sub-optimal.

Van Kerkhoff and Lebel (2006:460) observed that research [like extension] had become more participatory and new collaborative research models involving more actors, including farmers were becoming popular. The collaborative research approach is exemplified by some of the modern approaches such as the PTD, PFI and FFS discussed above (see **section 4.5.3**). New research models also take into account traditional or local knowledge (Van Kerkhoff and Lebel 2006:460). As pointed out by Llewellyn (2007:148), the main output of research was information while the main outcome was learning. In this regard, Hoffmann, Probst and Christinck (2007:361) argued that researchers should learn from the strategies that farmers used in dealing with complexity, and broaden their epistemological base by understanding the importance of phenomenology and the tacit knowledge of farmers. However, as concluded by Lele *et al.* (2010:96), research alone would not foster agricultural development, and research and development efforts needed to be inclusive and build from the farmers upwards in order to “release locked-up innovation” and thus produce enough food and eradicate hunger.

Lessons learned from AKIS studies pointed to the need to “improve the flow of technologies to farmers; the need for institutional reforms ... the need for stronger partnerships between research and other AKIS domains including the private sector” (Rivera, Qamar and Mwandemere 2005:53). The World Bank (2007c:265) also acknowledged that success in research and development has been mixed and that there was still high demand for appropriate agricultural technologies for small-scale

farmers. The World Bank (2007c:265) further noted that different types of farmers, for instance women farmers had special concerns that needed to be taken into consideration and argued for the interaction of diverse actors to encourage technology adoption. Scoones and Thompson (1994:28) pointed out that meaningful dialogue between agricultural researchers and extension workers should be underpinned by recognition of complexities of socially and politically differentiated knowledge generation, transmission and adaptation. Some complexities were exemplified by Rees *et al.* (2000), who noted that information flows to farmers from research and extension were inadequate. Other challenges included insufficient funding for research. In this regard, the Global Conference on Agricultural Research for Development (GCARD) 2010 Global Authors Team report (Lele *et al.* 2010:xviii) recommended that developing countries set apart one or 1.5% of their agricultural GDP to support national agricultural research.

#### **4.5.4 Education and training**

For Röling and Pretty (1997), the learning path entailed participatory learning and constituted four elements namely i) the information system that responds to the dynamic circumstances and allows for the participation of farmers in research, ii) the conceptual framework that enables farmers to have technical expertise, iii) new skills on production aspects such as compost making and pesticide application, and iv) high system-level management that adopts the “systems thinking” that include the management of natural resources. Learning entails change in behaviour through the acquisition and modifying of knowledge, “skills, strategies, beliefs, attitudes and behaviours” (Schunk 2008:1-2). Röling and Pretty (1997) recommended the development of “integrated curricula, professional training and internship programmes,” as well as joint efforts in research and training materials development. Petersen (1997), Rivera, Qamar and Mwandemere (2005:54-59) and The World Bank (2007b:32-33; 2007c:223) also emphasised the importance of aligning curricula of universities and training institutions to the needs of the industry. Various authors (Petersen 1997; Eicher 1999:32-33; The World Bank 2007b:xv) observed that the communication between extension and educational institutions in most African countries was poor, and argued for the need for strengthening research, extension and higher linkages. In addition, government and donor support for agricultural human capital had declined over the years (RoK. Ministry of Agriculture and Ministry of Livestock and Fisheries Development 2004:11; The World Bank (2007b:19). According to a World Bank (2007b:xv) report, “agricultural extension training supply [in Africa] is often out of synch with labour market demands in terms of knowledge and practical competencies.” In addition, the number of students applying for agriculture related courses was dwindling (The World Bank 2007c:26).

Although Rees *et al.* (2000:14) observe that farmers were keen to learn through direct interaction with researchers and extensionists operating within their communities, findings of AKIS case studies undertaken in ten developing countries showed that often universities teaching agriculture were not

connected to agricultural research and education (Rivera, Qamar and Mwandemere 2005:56). The RoK. Ministry of Agriculture and Ministry of Livestock and Fisheries Development (2004:11) observed that there was a mis-match between the market needs and the curricula (The World Bank 2007c:xv) (see **section 2.2.4.4**). The Pakistan case study on AKIS in particular pointed to the need to identify skills-gaps in a collaborative manner, involving planners and implementers of vocational education, relevant departments, the industry and beneficiaries and offering short-term training courses (Rivera, Qamar and Mwandemere 2005:56).

As was the case in most African countries, the linkages between extension, research and universities in Kenya were weak. The agricultural higher education component was considered the weakest while research was the strongest of the three components (Eicher 1999:38). The challenge was to build a national agricultural triangle that linked the three components to farmer organisations, the private sector, and other scientific communities in the region and world-wide. Scholars have recommended the adoption of a “systems approach” based on the AKIS framework to address the coordination and investment in research, extension and higher education to ensure sustainable agricultural institutions (Eicher 1999; 2004:6; FAO and The World Bank 2000). In this regard, the University of Nairobi and Egerton University have launched the Agricultural Information and Communication Management (AICM) programme, which was initiated by the Regional Agricultural Information Network (RAIN) of the Association for Strengthening African Agricultural Research in Eastern and Central Africa (ASARECA) (University of Nairobi 2009; Regional Universities Forum for Capacity Building in Agriculture (RUFORUM) 2010). The programme is expected to be rolled out in other Eastern Africa countries to address the skills gap in agricultural information and communication.

Many authors have recognised the important role of women in agriculture (Ndubi 1998:111,123; Salasya and Hassan 1998:77; Mchombu 1999; Manda 2002; Jones 2006; Nederlof and Dangbégnon 2007:374; The World Bank 2007b:24-25; 2009a). As stated by Swanson (2008:3): “Rural and farm women are among the most valuable yet most frequently overlooked....” Further, Rivera, Qamar and Mwandemere 2005:30) emphasised that women contribute significantly to food production for domestic and external markets. IFAD (1989) has been working towards increasing the number of female trainers and trainees throughout the projects it finances in Africa. Despite the efforts of IFAD and others, the need to train more female extensionists persists. For example, Salasya and Hassan (1998:77) observed that it was easier for male than female farmers to access education, extension, training, technology and credit services. Findings by Rivera, Qamar and Mwandemere (2005:54,59) indicated that it was necessary to promote training at all levels and to recruit and train women as extensionists and administrators to work with women in rural areas. Confirming these findings, The World Bank (2007c:24) pointed out that there were gender disparities in enrolment patterns.



Elsewhere, a case study by Shibanda and Seru (2002) in Kenya revealed that training for women in agriculture was limited in scope in terms of coverage of technical aspects. In this regard, Rivera, Qamar and Mwandemere (2005:54,59) recommended the need for gender-sensitive curricula.

Swanson (2008:5) noted that in most countries, the rural youth have not received adequate attention from extension systems. In Kenya, schools also play a role in transferring agricultural information to students and farmers. Learning takes place through agricultural and science classes, demonstrations and 4K clubs (Noordin *et al.* 2001:219). According to Smith (2003), learning calls for committed participation in the CoPs (see **section 3.2.1.3**), and is viewed as a special type of social practice associated with participation where learners participate in groups of other practitioners to acquire knowledge and skills. Newcomers with new knowledge and skills participate in the socio-cultural practices of the community (legitimate peripheral participation (LPP), where LPP facilitates interaction between newcomers and older members as well as about identities, artefacts and communities of knowledge and practice. Braun *et al.* (2007:19) pointed out that networks, such as the LLL initiative in Kenya facilitate learning. The LLL, which uses the internet to support “action learning activities,” supports farmer groups by providing access to market information services and by sharing practical experiences pertaining to new improved technologies. Other AKIS studies have recommended the need to offer short-term courses for farmers on various agricultural technologies (Rivera, Qamar and Mwandemere 2005:56). The newer models of learning have become more interactive, and platforms for sharing both tacit and explicit knowledge have been adopted such as the AKIS and social learning<sup>32</sup> models, where participants learn and are linked to action (Van Kerkhoff and Lebel 2006:462-463). These models are consistent with community learning models (learning organisation), which call for Senge’s (2006:6-12) five disciplines namely practicing personal mastery, awareness of mental models, building shared vision, team learning and systems thinking. As Steyaert *et al.* (2007:540) noted, social learning improves peoples understanding.

#### **4.5.5 Private sector**

Berdegúe and Escobar (2001:30) recognised the private sector firms, foundations and agro-industries as important AKIS actors. Various authors (Umali and Schwartz 1994:30; Rees *et al.* 2000:2; Berdegúe and Escobar 2001:30; Rivera, Qamar and Mwandemere 2005:57; Spielman 2005:13;

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<sup>32</sup> Social learning was described as a “framework for thinking about the knowledge processes that underlie societal adaption and innovation” and involves social actors at all levels who can learn and adapt (Röling and Wagemakers 1998:64-65). It is “a process that fosters the innovation and adaptation of technologies embedded in individual and social transformation” (Pretty and Wesseler 2004:8). As observed by Hoffmann, Probst and Christinck (2007:360), farmers learn during action, and the learning occurs as part of the day-to-day practice and experience. Social learning was described as a “framework for thinking about the knowledge processes that underlie societal adaption and innovation” and involves social actors at all levels who can learn and adapt (Röling and Wagemakers 1998:64-65). It is “a process that fosters the innovation and adaptation of technologies embedded in individual and social transformation” (Pretty and Wesseler 2004:8). As observed by Hoffmann, Probst and Christinck (2007:360), farmers learn during action, and the learning occurs as part of the day-to-day practice and experience.

Muyanga and Jayne 2008) have shown that some private sector actors were the key actors engaged in agroprocessing, marketing and in the delivery of agricultural knowledge and information. The private sector agents such as multinational, national agribusiness firms, small and medium enterprises, agroindustrial processing, marketing and distribution are becoming increasingly important (Spielman 2005:13). Some of these actors had been directly involved in the delivery of agricultural knowledge and information, while others played a role in advocacy and policy formulation. In addition, the private sector linked farmers to agricultural production, agroprocessing and marketing (Rivera, Qamar and Mwandemere (2005:57). The mass media played a role in collecting and disseminating agricultural related information using diverse ICTs (Rivera, Qamar and Mwandemere 2005:59), and examples are discussed below in **section 4.7.3.2**.

It has been observed that information and knowledge, which were seen as public goods in the past were now considered private goods that were protected by law (patents, copyright), and most information service providers are in the private sector (Rivera, Qamar and Mwandemere (2005:57). They argued that the private sector is playing an increasingly important role in sectors such as food and agricultural processing, and could influence the success of an AKIS and the livelihoods of small-scale farmers. Hence, linkages needed to be established between input suppliers such as agrochemical and seed suppliers to ensure farmers had access to inputs, and to credit organisations to improve access to financial resources and technologies (Petersen 1997; Rivera, Qamar and Mwandemere 2005:vi). Berdegúe and Escobar (2002:11) noted that there was increased growth of the private sector activities in the AKIS of developing countries and as concluded by Garforth, Phillips and Bhatia-Kanthaki (2007:723) the private sector was “indispensable for poverty reduction.”

A study by Rees *et al.* (2000:2) in Kenya showed that the private sector and agribusiness were active and well developed in the high potential farming areas, where they participated in technology development and dissemination. Provision of agricultural information and knowledge was also becoming fee-based, as exemplified by initiatives such as KACE in Kenya, and Tradenet.biz in West Africa and input stockists (see **section 4.7.3.2** below). Private extension services were also becoming increasingly important in agriculture world wide (Umali and Schwartz 1994:15; Alex *et al.* 2002:2,10; NAADS 2006; Klerkx and Leeuwis 2009:101; Nyambo *et al.* 2009:100), and were among the most crucial sources of information (Demiryurek *et al.* 2008). However, as observed by Rees *et al.* (2000:2) and Muyanga and Jayne (2008), the private sector and agribusiness actors were skewed towards well developed high potential farming areas that had promising returns, or were linked to economic objectives (Heemskerk and Wennink 2004:38-39). Private sector services need to be of high quality, systematic and affordable to the majority of farmers. Besides, and as pointed out by Laurent, Cerf and Labarthe (2006:12), private extension services are not able to fully meet the knowledge and information needs of farmers. In addition to production information, farmers need information and

knowledge on the environment and social aspects, which private extension service providers ignore. Klerkx and Leeuwis (2009:101) found problems with embedding private extension actors in the AKIS in a sustainable manner because of conflicting interests of the private actors. As emphasised by various authors (Laurent, Cerf and Labarthe 2006:12; Klerkx and Leeuwis 2009:101), there was a need to meet the holistic needs of farmers.

#### **4.5.6 Civil society organisations (CSOs)** <sup>33</sup>

NGOs, CBOs, faith-based organisations, associations and groups were important actors in providing agricultural information and knowledge to small-scale farmers (Petersen 1997; Leach 1999:81,85; Rees *et al.* 2000:2,3; Noordin *et al.* 2001:518; Bagnall-Oakeley and Ocilaje 2002; Davis 2004:186; Lele *et al.* 2010:65). NGOs have been in the forefront in providing inputs and advisory services to farmers (Petersen 1997); empowering farmers; and have led to collaborative activities such as analysing problems, sharing of information and joint decision making (Alex *et al.* 2002:17). NGOs have been involved in promoting development activities; in complementing the work carried out by other actors (Ekoi and Hepelwa 2003; Juma 2005:16) especially in providing training, information and improved technologies to community and farmers' organisations (including women) in rural areas (Noordin *et al.* 2001:518; Ekoi and Hepelwa 2003). Some have been engaging in participatory innovation development with farmers (Ekoi and Hepelwa 2003; Juma 2005:16; Waters-Bayer and Van Veldhuizen 2005:2); playing a key role in developing social capital and building trust and relationships at grassroots level, and in empowering farmers' groups (Heemskerk and Wennink 2004:38) and in supporting the formation of marketing groups (Mukhwana, Nyongesa and Ogemah 2005:9). Others have complemented government efforts (Juma 2005:16) by first understanding the culture of the community, which inculcated trust and facilitated uptake of new technologies (Duke and Long 2007); in resolving conflict and disputes (Neubert *et al.* 2007:17); in repackaging local content for farmers (Munyua 2007) and in working with farmers on agriculture and NRM (Promoting Local Innovation (PROLINNOVA) 2010).

In Kenya, NGOs have supported farmers to form collective marketing groups that link farmers to markets through establishing business entities that adhere to business principles and facilitate storage, loans and equipment (cleaning, drying, bagging) (Mukhwana, Nyongesa and Ogemah 2005:9). A study by Duke and Long (2007) examined an agricultural development model developed by a faith-based NGO - the Healing Hands International (HHI). The HHI argued that "trying to teach new methods for improving a person's life is cultural," hence focused on understanding the cultures of different communities to guide the introduction of drip irrigation and survival gardening in Ethiopia

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<sup>33</sup> Civil society organisations have been defined as non governmental organisations that are not for profit and comprise of a broad array of actors including NGOs, CBOs, faith-based groups, associations, foundations, unions, networks, and community groups (World Bank 2010).

and Malawi. As pointed out by Neubert *et al.* (2007:13), irrigation helped to improve food security, diversify production, improve household nutrition and increase income. According to Duke and Long (2007) irrigation was introduced using available resources and through training farmers as trainers in small groupings, while neighbouring farmers learned by observing others. Marketing was done through village production clubs and local cooperatives. The HHI study demonstrated a rapid uptake of the technology, suggesting that developing trust and social networks facilitated scaling up of new technologies and created economic viability. Despite their key role as dissemination channels, most NGOs operate on projects that have a limited span and hence are not sustainable. In addition, NGOs do not have adequate trained staff to cover a wide geographical area (Noordin *et al.* (2001:518), hence can only reach a limited number of communities (Alex *et al.* 2002:17).

CBOs are small groups that have diversified production systems (Alex *et al.* 2002:18), that are localised and respond to the felt needs of communities in a participatory manner (Abegunde 2009:237-238). A study carried out by Noordin *et al.* (2001:521) in Western Kenya showed that CBOs, such as women's, youth, and church groups worked with grassroots communities and played a key role in scaling up agricultural technologies and innovation. The CBOs easily reach farmers, and have helped to strengthen the capacity of rural communities by ensuring sustainability of community activities. As pointed out by Rivera, Qamar and Mwandemere (2005:45,55), this capacity makes CBOs a great asset in advancing the objectives of an AKIS at the grassroots. CBOs have been involved in farmer participatory approaches, participatory technology development and farmer networks. One key disadvantage of CBOs is that they lack adequate resources (Noordin *et al.* 2001:521). Associations and cooperatives also played a key role in sharing agricultural information and knowledge (Bernard and Spielman 2009:62,64).

#### **4.5.7 Small-scale farmers, farmers' organisations and networks**

Small-holder farming is considered very important in the context of food production and food security in Africa (South Africa. Department of Agriculture 1995; Nagayets 2005). The role of small-scale farmers and farmers' organisations was also discussed in **sections 1.1, 2.2.1 and 2.2.2**. Most small-scale farmers in Africa face many challenges and have resorted to working in groups to overcome some of their challenges (Dyck 1997; FAO 1998; Meyer 2000:154; Muktasam and Chamala 2001; Curtis and Cooke 2006; Madukwe 2006; Muyanga and Jayne 2006:19). The following review presents the role of small-scale farmers and farmers' organisations, and the challenges they face in the knowledge triangle and in agricultural development.

##### **4.5.7.1 Small-scale farmers**

Small-scale farmers play a key role in agricultural production and contribute to food production and enhanced food security (Ndubi 1998:111,123; Salasya and Hassan 1998:77; Mchombu 1999; Meyer

2000:194; Manda 2002; Berdegúe and Escobar 2001:56; Jones 2006; The World Bank 2006b:13). Hirst *et al.* (1988) observed that there is no universal definition of *small-scale farm* in developing countries. Hirst *et al.* (1988) pointed out that although development literature describes any farm that is less than five hectares as “small,” there are cases where land holdings may be two to five (2-5) hectares (usually less than two (2) hectares). The farmer may also own between, 10 to 20 head of livestock (often less than two (2) or none at all). According to Hirst *et al.* (1988), size was not an issue as the notion of “small” was determined by the ecotype and economic margins as determined by a given environment and production unit, and there is consensus that the concept ‘smallholder’ should be de-linked from the perception of land size. Hirst *et al.* (1988) shared the example of a farmer with one hectare of irrigated land in a high potential area and argued that this could not be compared to 100 hectares in a dry and arid land, located in a low potential area. In Kenya, smallholdings range from 0.2 to 12 hectares and produce about three quarter ( $\frac{3}{4}$ ) of agricultural output (Obara 1988; Oxfam Great Britain (GB) 2000) (see **sections 1.9 and 2.2.1**).

Small-scale farmers have been described as sedentary producers, agropastoralists or pastoralists who derive their livelihood from a mix of commercial and subsistence production (in crops or livestock) or either, where the family provides the majority of labour and the farm provides the principle source of income (Narayan and Gulati 2002; Davis, R. 2006), or farmers with a low asset base, operating less than two hectares of cropland (The World Bank 2003). Small-scale farmers form the majority of the rural poor in developing countries (Narayan and Gulati 2002). Although earlier perceptions suggested that small-scale farmers were backward peasants (Dixon *et al.* 1994:21), or passive recipients of technologies (Shrestha 1996), these farmers have a wealth of knowledge, which is an important source of research and development material, and are knowledgeable about local farming systems (South Africa. Department of Agriculture 1995:22; Engel 1997:40; Modi 2003:683). Farmers are “creative managers and integrators of knowledge and information” from diverse sources (Engel 1997:40), and are considered to be active and equal partners in their own development (Emery 2000:23; FAO and The World Bank 2000). Empirical evidence from an AKIS study conducted in Kenya showed that local actors (including farmers) were the most important sources for agricultural information and knowledge (Rees *et al.* 2000:5). In agreement, Hoffmann, Probst and Christinck (2007:359) noted that it is farmers who know their own preferences hence their ideas and views need to be incorporated into research. They argued that farmers play an important role in disseminating agricultural innovation because “they see knowledge in practice,” and have new knowledge that they can share orally through farmers’ social networks such as personal communication and neighbours. As pointed out by DePaula and Fischer (2005:34), social networks allow people to engage in collaborative activities that are socially meaningful, to create knowledge and link resources such as artefacts and information. Morris (2007:23) confirmed that networks facilitated learning and sharing of information and knowledge. As pointed out by Pike (2008), the manner in which individuals

influenced each other was complex and diverse and was tied to culture.

One of the major problems experienced by farmers is poor access to knowledge and information (Kaniki 1989; Aina 1995; Ndiaye 1995:115; Koutsouris and Papadopoulos 1998:89; Rees *et al.* 2000; Machuka 2001; Munyua and Adupa 2002; 2007; IDRC 2004; Stefano *et al.* 2005b). Other authors (Kidane, Maetz and Dardel 2006:xiv,55; Darroch and Mushayanyama 2009:102) referred to weak information systems, poor regulatory frameworks and inadequate market information. In several studies, farmers cited inadequate awareness of the existence of information channels that could help them improve their farming systems (Abid 1995:13; Kimenyi 1998:201,210; Stefano *et al.* 2005b:64; Darroch and Mushayanyama 2009:102). Other studies have also shown that existing systems do not provide for the strong participation of indigenous populations and doubted the credibility of the knowledge of farmers (Temu, Mwanje and Mogotsi 2003:3-4). Respondents of a study on ICTs and small-scale agriculture in Africa mentioned poor access to external information and knowledge, inadequate application of local knowledge and information, poor access to markets, market intelligence and inadequate opportunities, and lack of appropriately packaged local content as the main barriers to accessing agricultural information (Munyua 2007).

Additional challenges include low productivity (Pretty 1994:37; Noordin *et al.* 2001:509; UNDP 2005:148-49), low adoption of modern farming and sustainable agriculture practices, inappropriate technologies for local farming systems (Bay-Petersen 1985; Pretty 1994:37; Kimenyi 1998:201,210; IFAD 2002b; Franzel *et al.* 2004), and unfavourable policies and trade practices (Bunders and Broerse 1991; Munyua *et al.* 2003; Jones 2006). Further, Baker *et al.* (2001) noted that small-scale farmers were “dispersed, poorly represented and can be uninformed and misinformed.” Franzel *et al.* 2004) stated that adoption was particularly low where farmers were unfamiliar with the improved technologies or practices, and most of the technologies developed were too expensive (in terms of inputs required – seed, fertilisers, pesticides) for small-scale farmers (Reij and Waters-Bayer 2001a:3). For instance, Micheni and Gathama (1999:28) observed that most farmers in the Kenyan highlands were resource poor and could not afford farm inputs. Likewise, Berdegúe and Escobar (2002:12) and Matovelo, Msuya and De Smet (2006) noted that some farmers did not have resources to implement ideas from the information they accessed, or to access training opportunities (Koblik and Aguiar 2008:166). They received low prices for their produce (Oxfam GB 2000; Röling 2004:17; Darroch and Mushayanyama 2009:102), and transport and transactional costs were very high (UNDP 2005:148-49; Darroch and Mushayanyama 2009:102). Using coffee as an example, the Oxfam GB (2000) organisation pointed out that farmers were receiving only 30% of sales proceeds.

Efforts made towards improving the plight of small-scale farmers have been particularly slow and the quality of life in rural areas has continued to deteriorate (Camble 1994; Thomas 2005:75; Jones

2006). It is also noteworthy that it is the large-scale farmers, and not small-scale farmers who were the target of agricultural investment in most African countries (Temu, Mwanje and Mogotsi 2003:3-4). These authors observed that small-scale farmers focused on subsistence agriculture and exported unprocessed produce. This lack of value addition denied the smallholders additional income they would have otherwise earned through agroprocessing. Markets were considered to be among the key drivers of change in agricultural development (The World Bank 2006e). Focusing on markets, Thomas (2005:78) argued that reliable output markets were an incentive for the adoption of new technologies. According to Thomas (2005), farmers considered investment in a new technology to be too risky where prices were volatile. Empirical evidence from the “Fruits of the Nile” initiative in Uganda supported this assertion and showed that a sustainable market for dried fruits had supported over 200 farmers’ groups but adoption is high where markets are guaranteed. Braun *et al.* (2007:19) further confirmed that market information in rural areas was poor and that farmers were willing to improve and intensify their farming activities in as much as this would earn them good money.

Focusing on gender, a substantial body of research has observed that the majority of small-scale farmers in Africa are women, and their contribution in agricultural and economic analysis and policies have been acknowledged (Dixon 1982:561; Gellen 1994; Blumberg 1994; Salasya and Hassan 1998:77; Mchombu 1999; Meyer 2000:194; Mutua-Kombo 2001; IFAD 2002b:46; Manda 2002; Jones 2006; Nederlof and Dangbégnon 2007:374; Lele *et al.* 2010:17). Women have also been recognised as repositories of natural resource management (IIRR 1996:10,154). Nevertheless, the role that women play has often been undervalued and in some cases, women have not been classified as farmers (Jiggins, Samanta and Olawoye 1997). For instance, in 1965, Nigerians defined a farmer as “an adult male ... who has the right to the produce of a farm” (Federal Office of Statistics 1966:3 cited in Jiggins, Samanta and Olawoye 1997). Ndubi (1998:111) noted that women in Kenya were regarded as family workers belonging to their husbands. Other authors observed that women have often been under-represented or not included at all at the decision making levels (Kabutha 1998:223; Kiondo 1998:243-244; Mchombu 1999:212; Shibanda and Seru 2002; Lele *et al.* 2010:17).

It has been observed that although efforts have been made to enable women farmers to access information, training and technologies, the demand for service surpasses supply and there is greater pressure on rural women. Some women sought information on their unmet needs from informal social networks or relied on their own experience (Leckie 1996:316; Kiptot *et al.* 2006). This shortfall makes gender a critical variable for analysing challenges and opportunities in agriculture (Jiggins, Samanta and Olawoye 1997). They pointed out that rural women in developing countries possess assets in the form of the skills and techniques, which need to be harnessed to contribute to agricultural development. In Kenya, it was observed that most farmer committee representatives were men and the majority of farmers who participated at research open days were men (Ndubi

1998:121). The World Bank (2006b:13,15) confirmed the need to provide better services to women to ensure higher yields and improved quality of life. In addition, many authors have noted that very few young people engaged in farming activities (Mishev and Kostov 2004:11; Aina 2007:2; Sambodo 2007:160; Man 2009:11).

Male and female farmers carried out different activities on the farm. For example Curry, Kooijman and Recke (1998:95-98) noted that generally the female farmers engaged in weeding, harvesting, post-harvest activities as well as milking, while male farmers prepared the land, took livestock to the dip and made decisions on the marketing of milk. It is also acknowledged that most subsistence crops were produced by women while men produced cash crops (Suda 2002:313; Di Mauro 2003:518; Omwoha *et al.* 2007:370; The World Bank 2009a:15). Gender issues have been handled differently in different communities depending on their cultural backgrounds, technology and intervention requirements (Curry, Kooijman and Recke 1998:6; Kimenye 1998:201; Kooijman and Mbaabu 1998:32; Ndubi 1998:111; Karamagi Akiiki 2006:76). Effective communication networks have been observed among women in some communities (Engel and Salomon 1997). To respond to some of the challenges, Rivera, Qamar and Mwandemere (2005:59) suggested the need for gender sensitive research agendas in the study of AKIS. In Kenya, some efforts have been made to bridge the gender divide (see **sections 2.2.4** and **2.2.6**), and increasingly extension and advisory services are being provided through women's groups (Mutua-Kombo 2001).

Various international organisations consider it necessary to integrate gender needs in AKIS projects (FAO LiNKS Project 2003; 2004; The World Bank 2004c), and efforts have been made to ensure the inclusion of women in development activities in developing countries through policies and practices (Lele *et al.* 2010:18). To understand some of the gender challenges discussed above, the present study adopted a gender dimension and classified respondents (individuals and farmers' groups) into men, women and youth groups.

#### **4.5.7.2 Small-scale farmers' groups, organisations and networks**

Having outlined and described the role of small-scale farmers and the challenges they face in the agricultural sector, the following section reviews the role of farmers' groups and organisations in detail. As emphasised by Chipeta (2004:11), "Self-organization by farmers was the basis for all developments initiated from the 'bottom-up'[approach]." Pretty and Wesseler (2004:3) noted that people had worked collectively for a long time to manage natural resources, share labour, market their produce jointly and that these collaborations had been institutionalised in the form of local organisations, youth groups, societies, women groups, self-help groups and farmer groups. Scholars have pointed out that the new demand-driven advisory and service delivery approach works through farmer groups and associations, stakeholder participation in agricultural development activities



(Moussa 2006; Opondo *et al.* 2006). Other groups identified by The World Bank (2009a:64) include producer groups, self-help groups, user groups, FFS and “merry-go-rounds”<sup>34</sup>. Preliminary findings under this new approach has indicated improved flows of information and knowledge and strengthened linkages with other actors.

Some of the groups were formal, while others were informal and more flexible (FAO 1998). Formal groups were registered hence had legal status, and had leadership structures (Meyer 2000:155; Davis 2004:91; McClelland, Gartmann and Van Rees 2004:6) and rules that governed the groups (Pretty 2003b:1913). Farmers’ groups were of varying sizes, and while some had between 20 and 30 members (Pretty 2003b:1914; Madukwe 2006), others had an average size of 44 (Curtis and Cooke 2006:10), while others had groups of 10 to 20 members (The World Bank 2009a:64). As noted by Stringfellow *et al.* (1997), the size of the group affected the cooperation and the bonding of group members and small groups facilitated face-to-face interactions, access to financial resources and accountability. While some groups were relatively young, others were well established and according to Barham and Chitemi (2009:57), there was a correlation between the age of the group and the marketing of produce and the more mature groups appeared to be more successful in tapping into market opportunities than the newly established groups because they had easier access to resources and contacts.

While some groups had external funding to support the activities of the group (Anderson and Feder 2004:52; McClelland, Gartmann and Van Rees 2004:5,6; Curtis and Cooke 2006:24), others relied on contributions from members. However, Klerkx (2008:162) observed that funding of groups was a challenge. Most groups met at different public venues such as schools, markets or churches (Meyer 2000:155; Davis 2004:137). Some of the challenges that small-scale farmers’ groups face have been outlined in **sections 1.1** and **2.2.2**. Kenya in particular, has a history of mobilising local communities to participate in agricultural initiatives through cooperatives, farmers unions, associations, farmers’ groups, social groups, research groups and “*barazas*”<sup>35</sup> or committee meetings.

Chamala and Shingi (1997) pointed out that rural development policies had designed frameworks to help organise farmers into groups and farmer organisations to ensure targeted delivery of services. Among the benefits to operating in groups are collaborative purchasing of inputs, better markets and

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<sup>34</sup>“Merry-go- rounds” are an innovative arrangement between farmers’ group members who come together to pool resources. The members contribute money regularly to build a reservoir of funds The members contribute money regularly to build a reservoir of funds (a revolving bank) and the money is loaned to members on a rotating basis or invested. The ‘merry go rounds’ have provided easy access to credit.

<sup>35</sup> Baraza is a Kiswahili word meaning a public space or gathering of people for the purpose of a meeting. People may meet to communicate information, chat or negotiate (Oxford University 2004:23; Loimeier 2005:26-27). Barazas provide a way of “understanding social institutions” and meetings may be simple informal gatherings of people or formal public or communal meetings. Barazas ensure a process of social inclusion into a community (Loimeier 2005:26-27).

prices due to larger and sustainable volumes, strengthening farmers bargaining power with traders, access to group training, reducing transaction costs, access to credit facilities and knowledge and information on new technologies and improved farming practices (Dyck 1997; Stringfellow *et al.* 1997; FAO 1998; Meyer 2000:154; Tchawa, Jean-Baptiste and Bonneau 2001:25; Ekoi and Hepelwa 2003; Place *et al.* 2004:258-259; Meyer 2000:154; Muriuki *et al.* 2003:71; Curtis and Cooke 2006; Madukwe 2006; Cameron 2007:373; Galindo 2007; Mishra and Swanson 2009:340), as well as creating employment (McClelland, Gartmann and Van Rees 2004:6,7). As pointed out by Petersen (1997), grass-roots farmer organisations have a wider reach to farmers. The group approach has further facilitated individual farmers participating in economic activities (Heemskerk and Wennink 2004:41-42), and in joint action-based learning, and has empowered farmers to have ownership of their own development (Moussa 2006; Opondo *et al.* 2006).

Leadership and culture are crucial for the development of groups. Various authors (Chamala and Shingi 1997; McClelland, Gartmann and Van Rees 2004:8; Curtis and Cook 2006:42) have shown that strong leadership contributed to the success and sustainability of groups. As pointed out by the LEISA (2007) organisation, farmers' groups were founded on community ties, tradition, trust and obligations, and the glue that binds the farmers together is the belief that there is strength in numbers. Experiences in Brazil, Ghana, India and Philippines have demonstrated that farmers' groups were formed in response to a "felt need" (LEISA 2007:5). Galindo's (2007:89) case study in Mexico showed that organic farmers were participating in "a corporate fashion" to market their produce.

Further, the Phokoane study in South Africa demonstrated that group formation facilitated training of large numbers of farmers (Meyer 2000:154). As evidenced by Leach's (2001a:55) study, rural communities preferred a group-based rather than a one-to-one approach. Farmers' groups generated social capital which facilitated bonding and bridging between groups, and linking of agricultural service providers (Heemskerk and Wennink 2004:17-24; Pretty 2008:179; Gotschi, Njuki and Delve 2009:27). The linkages ensured inclusiveness of farmers in local innovation systems (Heemskerk and Wennink 2004:17-24), and the social norms and bonds between group members were essential for sustainability (Pretty 2008:179). In addition, groups created cohesiveness and provided a sense of ownership of the development process (Noordin *et al.* 2001:512-515). As reaffirmed by Sharp and Smith (2003:925), there was need for collective action in building social capital, which lubricated the process of learning and facilitated the sharing of information and knowledge (Kilpatrick and Bell 1998). Farmers groups shared common interests, problems, information, supported one another socially and enhanced group dynamics (Meyer 2000:154; Onduru *et al.* 2002). As pointed out by McClelland, Gartman and Van Rees (2004:2), "in isolation, most farmers would not be inclined, or able, to access such information." In addition, groups created

cohesiveness and provided a sense of ownership of the development process (Noordin *et al.* 2001:512-515).

Empirical evidence (Umali and Schwartz 1994:39; Kimenye 1998:206; Ndubi 1998:114; Mulaa *et al.* 1999:27; Rees *et al.* 1999a:6; Mutua-Kombo 2001) has shown that groups forged linkages with other actors such as horticultural exporters to access services from technical experts, extensionists, input suppliers, spraying services and marketing services. Tchawa, Jean-Baptiste and Bonneau's (2001:25) study in Cameroon revealed that farmers' groups stimulated and facilitated the exchange of experiences with improved farming systems. A survey evaluating the Landcare groups in Australia showed that groups played a catalytic role in rural development and had attracted and helped to improve communication among landholders and learned through interaction and access to resources (Curtis and Cooke 2006:5,16-19,20,36). Learning occurred through day-to-day practices, actions and experience over time (Hoffmann Probst and Christinck 2007:360). In addition, findings of a case study in Australia revealed that grower groups worked with other community based farming systems groups, researchers and the private sector to form partnerships. These partnerships had led to the development of complex networks that had improved the flow of information and enhanced access to research outputs and current external information (Gianatti and Carmody 2007:166-171). However, according to Gotschi, Njuki and Delve (2009:275), more men than women gained from the benefits of social capital.

Groups have also improved market transactions, and have allowed individual members to better cope with risk (Place *et al.* 2004:258-259). As earlier pointed out by Fakava, Nurthall and Nartea (2001:9), one of the main objectives of subsistence farmers in Tonga was risk minimisation, while others included home sustenance, religious obligations, and profit maximisation. In Fiji, farmers spent 5-15 hours a week on religious and communal activities (Bachmann 2000:99). Groups facilitated access to improved technologies (Place *et al.* 2004:258-259; Meyer 2000:154; Muriuki *et al.* 2003:71; Curtis and Cooke 2006; Mishra and Swanson 2009:340), as well as allowing farmers to "select and adapt technologies" to local conditions and to use their local knowledge (The World Bank 2007c:160). In Australia, farmers' groups had helped to improve communication among farmers, learning through interaction and access to resources (Curtis and Cooke 2006:5,16-19,20,36); linkages with researchers and the private sector through partnerships (Gianatti and Carmody 2007:166-171); were cooperating and were carrying out socially oriented and environment related activities that impacted positively on the larger community (Marshall 2004:284). For example, the Landcare movement in Australia embraced social capital through engagement in group related activities that raised awareness and provided skills in environmental management and provided a platform for the sharing and exchange of information and ideas (Webb and Cary 2004:5-7).

A participatory approach facilitated joint action-based learning (Moussa 2006; Opondo *et al.* 2006). In addition, in Australia and New Zealand, groups facilitated marketing. McClelland, Gartmann and Van Rees (2004:6) and Lawson *et al.* (2008:12,19,20) demonstrated that “farmers’ markets” provided market outlets for smallholders and created value through cooperative activity. These authors attributed the perceived benefits of “farmers’ markets” to sharing of ideas, circumventing intermediaries, cost savings and sharing of equipment, networking and supporting one another, attracting new traders to the market and economies of scale. In Vietnam, farmers had formed marketing cooperatives to reduce prices, find better prices and develop deeper insight into markets and the marketing (Chau *et al.* 2004:108).

In Kenya, Ndubi (1998:114) observed that there has been a history of mobilising local populations into groups to participate in development initiatives such as farmers’ participation in on-farm trials, research groups and committee meetings. Farmers’ groups have provided access to extension and advisory services (Kimenye 1998:206; Mutua-Kombo 2001) and marketed agricultural produce jointly (Mukhwana, Nyongesa and Ogemah 2005:7,8). For instance, farmers in Western Kenya resorted to collective marketing initiatives and strategies to get better prices. In this particular example, some 2,000 farmers joined forces and started 25 cereal banks that were marketing maize communally for farmers (Mukhwana, Nyongesa and Ogemah 2005:7,8). Researchers are also collaborating with farmers in conducting research (Ndubi 1998:114; Rees *et al.* 1999a:6). Farmer research groups have provided mechanisms for strong collaboration between researchers, extensionists and farmers (Mulaa *et al.* 1999:27; Kamau 2007).

Under the village committee approach<sup>36</sup> in Western Kenya, groups (youth, church, women’s, clans and self-help groups) have worked with facilitators to disseminate improved technologies to farmers in villages with support from external facilitators (Noordin *et al.* 2001:512-515). These committees have led to an improved uptake of introduced technologies, helped to identify the key problems encountered by farmers, provided a channel for communicating ideas, information and knowledge, and have helped to mobilise collective action and change the attitudes of farmers. Generally, farmers’ groups have provided platforms for sharing common agricultural interests and problems, learning and discovering together, sharing information and knowledge and strengthening the cohesiveness of their communities (Röling and Jiggins 1998; Meyer 2000:154; Curtis and Cooke 2006; Madukwe 2006; Galindo 2007; LEISA 2007:4,5). In some cases, farmers’ networks have

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<sup>36</sup> The village committee approach aims to make all farmers in a village work with groups of 15 to 20 men and women of different backgrounds and socio-economic status that are represented in a village committee. The village committee is comprised of delegates from the respective groups. Extensionists pass on messages to the village committees, who in turn create awareness and disseminate technologies through the group representatives to the entire village. The village committee selects two delegates to represent the village on the sub-location committee (Noordin *et al.* 2001:512).

facilitated learning, innovation and the sharing and exchange of agricultural information. For example, empirical evidence from Ghana showed that the adoption of agricultural inputs had improved through information being shared by local farmer networks (Conly and Udry 2001:668-669). Earlier, Marsh and Coleman (1956:590) showed that farmers in a group motivated and influenced each other and improved the level of adoption of new technologies.

Nevertheless, various authors have pointed out that farmers' groups were not appropriate in all cases. It has been observed that many farmer organisations started off actively but soon become inactive or defunct (Chamala and Shingi 1997; Curtis and Cooke 2006:5,10; Noordin *et al.* 2001:515). Farmers' organisations have poor linkages to other agricultural actors (Den Biggelaar and Mugo 1996; Ndungu, Nkonge and Rees 2000; Rees *et al.* 2000; Hooton *et al.* 2006), have conflicts and lack institutional support for knowledge, logistics and resources (Noordin *et al.* 2001:511). Senge (2006:232-3) has noted that teams may face a conflict of ideas. According to Muktasam and Chamala (2001:123), groups, (including farmers' groups) were affected by top-down dominance, inadequate incentives and poor coordination, which contributed to barriers to learning. In addition, the IFAD (2002b:53) found that the level of organisation of the groups was still very low. In cases of high poverty, the very poor could not afford the demands and costs of group membership (Ekoi and Hepelwa 2003), such as the registration fee (Davis 2004:100). Curtis and Cooke (2006:5-6) and Hooton *et al.* (2006:547) observed the challenge of insufficient support in establishing, structuring and managing of groups. For example, research conducted by ICRAF and collaborating national partners in Western Kenya showed that local committees (village, sub-location or location) required strong follow-up by extensionists or NGOs or else they became ineffective (Noordin *et al.* 2001:521). As further emphasised by Senge (2006:217-9), the non-alignment of team or group members led to individuals working very hard but independently and their efforts not translating into benefits to the group. Indeed many authors (Noordin *et al.* 2001; Davis 2004; Hooton *et al.* 2006; De Haen, Henne and Stoyke (2007:7,11) have emphasised the need to strengthen farmers' organisations and groups in order to facilitate dialogue between farmers and other actors.

Farmers' networks, which facilitated social connections between groups, improved communication, provided mechanisms for exchanging information and enhanced understanding of broader community issues (Pretty and Wesseler 2003:5; McClelland, Gartmann and Van Rees 2004:6; Curtis and Cook 2006:20; Kiptot *et al.* 2006; Masandika and Mgangaluma 2006:87; Guèye 2009:122). Examples of farmers' networks included the social networks of farmers in Western Kenya (Kiptot *et al.* 2006); the *Mtandao wa Vikundi vya Wakulima Tanzania (MVIWATA)* network and the *Mtandao wa Vikundi vya Wakulima wa Wilaya ya Monduli (MVIWAMO)* networks in Tanzania (Masandika and Mgangaluma 2006:87) and the African Network for Rural Poultry Development (Guèye 2009:120-122). Others included the Birchip cropping groups (McClelland, Gartmann and Van Rees 2004:6)

and the Landcare groups in Australia (Curtis and Cook 2006:20). The present study investigated the role of farmers' groups and networks in the AKIS of Kirinyaga district in Kenya.

#### **4.5.8 Development partners**

Development partners (donors) are significant actors in an AKIS (Den Biggelaar and Mugo 1996; Anderson and Feder 2004:52; Rivera, Qamar and Mwandemere 2005:59,69,115; Waters-Bayer and Van Veldhuizen 2005:2). In Kenya, for example development partners such as the World Bank, Sida, CIDA, DFID, USAID, JICA and GTZ, are significant. The World Bank had supported a number of initiatives including the T&V extension model (Umali and Schwartz 1994; Chepsaigutt 1997:248; Röling and Pretty 1997; Reij and Waters-Bayer 2001a:3; Alex *et al.* 2002:7; Kiptot *et al.* 2006) and the KAPP, which aims to increase productivity and accelerate agricultural growth (Brooks 2006:xxv; Kiome 2009:22), and to enhance linkages within the agricultural system (technology generation, disseminating and empowering farmers to adopt improved technologies) through a systems approach.

However, there have been sustainability challenges with regard to donor funded projects and programmes (Rivera and Qamar 2003:15-16; Waters-Bayer and Van Veldhuizen 2005:2). As recently pointed out at the GCARD conference in Montpellier (Lele *et al.* 2010:xiii,xxiii,46,68), development partners like governments have failed to honour promises on targeting food and agriculture and had allocated funds to activities that did not benefit the poor. Lele *et al.* (2010) point out that donors need to include a package of “research, extension and capacity building” in the donor support portfolio because “without investments in agricultural and overall economic and social development, research alone would be a blunt instrument in efforts to eradicate poverty and hunger.” There was also a lack of coordination of activities funded between donors and initiatives funded by donors who did not have functional exit strategies.

#### **4.5.9 Other key actors**

Other important actors included credit and microfinance institutions (Stringfellow *et al.* 1997; Neubert *et al.* 2007:47; Owusu-Frimpong 2008:190). Some of the successful agricultural small-scale microfinance lending institutions in Kenya included KREP Bank, Faulu Kenya, KWFT, and some NGOs such as Care Kenya and Plan International, cooperatives, “merry-go-rounds” and Rotating Savings and Credit organisations (ROSCAS) (Muriuki *et al.* 2003:37), and Drumnet (Giné 2005). Some credit was provided in-kind, such as through the provision of inputs (Sanchez, Denning and Nziguheba 2009:40). However it was observed that some farmers were able to access credit and microfinance from lending institutions (Stringfellow *et al.* 1997; Muriuki *et al.* 2003:37; Kibaara *et al.* 2009:53), but others did not have easy access to this invaluable service (Giné 2005; Ruse 2006:22; Maatman and Schader 2009:5). Gender inequalities for example had denied women access to credit

(RoK. Ministry of Finance and Planning 2002a:27; Fatima 2009:1051), and most beneficiaries of agricultural credit were male farmers (Francis 1998:78; Doss 2001:2081; Fatima 2009:1051; Oyedele *et al.* 2009:196; UNECA 2009:136). In addition, while the repayments by some farmers' groups were good (Giné 2005; Owusu-Frimpong's 2008:190), others reported low repayment performance (Adegbite 2009:123-124).

Other actors included neighbours and family who were important sources of knowledge for small-scale farmers (Rees *et al.* 2000) and markets which were a key source of market and price information (La Trobe 2001:185-186; Sturges and Neill 2004:61; Davis 2004:102; Rivera, Qamar and Mwandemere 2005:31). The media were important in providing agricultural information (Bachmann 2000:65; Davis 2004:129; Rivera *et al.* 2005:59), such as that relating to new technologies, best practices and policy (Rivera *et al.* 2005:59).

#### **4.6 A review of related AKIS studies**

A review of the literature suggests that agricultural knowledge and information are vital tools for improving the livelihood of small-scale farmers. AKIS studies have been conducted in many countries all over the world, and the findings from these studies have led to calls for improved linkages and partnerships among key actors. Indeed, it has been observed that the integration between people and institutions especially between research-extension-farmers had not been successful in both developing and developed countries (Del Castello and Braun 2006:2). While a few AKIS studies were outlined in Chapter one, the following section reviews these studies, presents an overall view of AKIS and provides a landscape of AKIS studies from a global, African and Kenyan perspective.

##### **4.6.1 Global landscape of AKIS**

Agricultural knowledge systems have become common practice (Röling and Jiggins 1998:304), and AKISs have become of interest at local, national, regional and international levels (FAO and The World Bank 2000; Horstkotte-Wesseler *et al.* 2000). The FAO and The World Bank (2000) have been the main organisations behind the AKIS concept, and have developed a strategic document that describes briefly the vision, strategies and guiding principles for designing an AKIS in the interest of improving linkages between actors and improving agricultural productivity. There is indeed a growing interest in rural AKIS and several studies have been carried out in Africa (see **section 4.6.2**), Australasia (Bachmann 2000; Best *et al.* 2005; Prasad and Rasheed), Canada (Pinard 1996), Europe (Boonekamp *et al.* 1996; Thompson 1998; The World Bank 2005:28; Klerkx and Leeuwis 2009), Latin America (Carrasco (2001), Middle East (Mirikhoozani 1993), and the United States of America (McDowell 2004), and a number of developing countries Rivera, Qamar and Mwandemere (2005:1).

The study by Mirikhoozani (1993) in Iran, which focused on wheat farmers, revealed that farmers (especially small-scale farmers) did not adopt the technologies that were introduced. Reasons for non-adoption included inappropriate technologies, lack of inputs, inadequate market structures, lack of synergies in tasks carried out by research, extension, training institutions and farmers, as well as weak coordination. To address these constraints, Mirikhoozani (1993) recommended policy reforms to improve performance by the key actors. In Canada, Pinard (1996) conducted an exploratory case study of the AKIS of the Bois-Francs region to gain a better understanding of the necessary institutional and organisational changes required in supporting organic agriculture and value addition in the region. Pinard's (1996) study pointed to the need for collective organisation, diversification and commercialisation in ensuring sustainable agriculture. This study revealed that farmers relied on diverse sources of information including personal experiences, informal sources of knowledge and information, private organisations, group advice and training sessions. A key finding of this study was that the linkages between actors of the AKIS of organic farmers in Canada had more horizontal linkages and greater participation of farmers.

Boonekamp *et al.* (1996) explored the collaboration between nutrition related associations in different sectors and assessed the KIS of Valencia region's food sector in Spain with a bias towards health aspects. Applied research was conducted using RAAKS, interviews, a questionnaire and a workshop (Boonekamp *et al.* 1996:311-312). Statistical analysis was carried out using the MICMAC programme. Findings of this study concurred with those of Mirikhoozani (1993). The Boonekamp study established that linkages between significant organisations in the food sector were weak and information exchange between them needed to be improved. This study also demonstrated that RAAKS could be applied to disciplines other than agriculture. In Greece, the FRIENDS project identified services that addressed the needs of the Greek agricultural market and developed an electronic information system for many different users in the agricultural communities (cooperatives, farmers, researchers, agribusiness, government organisations, young farmers and students (Thompson 1998). Klerkx (2008) and Klerkx and Leeuwis (2009) studied agricultural innovation systems and investigated the role of intermediaries in information and knowledge provision with emphasis on organisational arrangements – private and public sector service providers based on demand.

In Cuba Carrasco (2001) investigated the role of extension programmes in contributing to food security. This study focused on an urban area. Carrasco's (2001) study proposed a generalised holistic AKIS model. However, as previously pointed out by Rees *et al.* (2000) agricultural knowledge and information systems are complex and diverse and vary with enterprise, agroecology and region, hence the general model developed by Carrasco (2001) may not be applicable to rural areas. A review of the literature on AKIS by Berdegúe and Escobar (2001) investigated options for reducing poverty by stimulating increased agricultural productivity through improved performance of



AKIS. This analysis singled out the impact of poverty on agricultural innovation processes and concluded that diverse approaches and multiple interactions of actors including research, extension, markets, government systems, social norms and factors that create incentives for farmers were necessary to improve the performance of AKIS. This review recommended the need to employ differentiated strategies to address commercial farming, resource poor small-scale farmers, and rural marginalised communities, while crafting agricultural innovation policies targeting poverty reduction.

McDowell (2004) addressed the role of AKIS in supporting and regulating agricultural activities in the USA. A key finding of this study was that policies were not driven by the needs of the farmers but rather, were driven by politics. A report by The World Bank (2005:28) in Armenia pointed out the need for a harmonised and rationalised national strategy by both government and development partners for the reform of a national AKIS, to avert conflict between actors and ensure coordinated implementation and increased agricultural productivity. Best *et al.*'s (2005) study on AKIS in Bangladesh was an applied research, designed to solve an existing problem. The study used PRA and RAAKS, and identified the information needs and knowledge gaps of participants, instruments and mechanisms used to obtain information and media preferences. Findings of this study showed that farmers preferred face-to-face channels. In contrast, the present study was basic research as discussed in **section 3.1.1**.

A study by Bachmann (2000) investigated the agricultural knowledge system in Fiji, and focused on the Ministry of Agriculture. Bachmann's (2000) study used PAR methodology and PRA, RRA, RAAKS, interviews, a questionnaire, observation, workshops and case study methods to explore the opportunities and limitations of participatory methods in integrating farmers' problems in the knowledge system and to improve information flows. Findings of the Bachmann study revealed that participatory methods were suitable in initiating dialogue between actors and in assessing the problems of farmers. The study further demonstrated that platform models were suitable for promoting innovation and development improving linkages, coordination and better interplay of actors. This study also showed that chiefs were important. It recommended the use of more participatory methods and the creation of more opportunities for applying participatory methods to ensure integration of farmers into the knowledge and information system. The present study adopted a multiple method research design (see **Chapter five**) to ensure integrated and balanced contributions from all actors, and employed most of the data collection methods used by Bachmann (2000).

Prasad and Rasheed's (2005) study used RAAKS, and Biggs and Matsaert's (2004) Actor Linkage Matrix (ALM) to explore the fodder innovation system of two districts in Andhra Pradesh. Rivera, Qamar and Mwandemere's (2005:1,15-17,23) case studies were carried out in 10 developing countries in Africa (not inclusive of Kenya), Asia, Eastern Europe and Latin America to investigate the existing

AKIS. These cases were guided by the principles previously suggested by FAO and The World Bank (2000). A mixed qualitative and quantitative methodology was used, while the research methods included a review of secondary information, questionnaires, group and individual interviews with key informants, workshops, and seminars. These case studies pointed out policy challenges calling for more empowerment of local organisations and people, creation of institutional structures and investment in training and education. Findings of these studies were consistent with those of Mirikhoozani (1993), Bachmann (2000), McDowell (2004), and Best *et al.* (2005). These findings demonstrated that AKISs were location specific and countries that were at different stages of AKIS development had varying degrees of linkages between the sub-systems. The study revealed the need to strengthen linkages, especially the connections with farmers. The present study was informed by the methodology and research methods used by Rivera, Qamar and Mwandemere (2005).

#### **4.6.2 AKIS studies from Africa**

A number of AKIS studies have been carried out in Africa (excluding Kenya) (Garforth 2001a; 2001b; 2001c; 2002; Worth 2001; 2006; Bagnall-Oakeley and Ocilaje 2002; FAO Local indigenous Knowledge System (LiNKS) Project 2003; FAO Noragric LiNKS Project 2004; Rivera, Qamar and Mwandemere 2005; Stefano *et al.* 2005b). Garforth's (2001a; 2001b; 2001c) study of a local AKIS in sub-Zoba Hagaz, Eritrea focused on developing methods for analysis that could be used in dialogue between farmers and advisors. The study used PRA methods, a questionnaire, semi-structured interviews and workshops, to identify the key information and technology needs of farmers in different localities. In addition, this study assessed the constraints of the existing AKIS and established the role of local and external information and knowledge in promoting agricultural and rural development. The study findings suggested the need for improving linkages, training, participatory adaptive research and exchange of information, and demonstrated that an AKIS empowers farmers to participate in development and contribute to the improvement of extension and advisory services.

Garforth's (2001a) study observed unique problems, constraints and opportunities in different villages, and pronounced differences in information and knowledge needs and information seeking behaviour between villages, gender and socio-economic categories. Garforth recommended the use of formal and informal channels of communication to improve the exchange of appropriate information and knowledge between actors. This recommendation was supported by other authors (Meyer 2000; Bagnall-Oakeley and Ocilaje 2002; Garforth, Khatiwada and Campbell 2003; Stefano *et al.* 2005a). Garforth's (2001a; 2001b; 2001c) study did not investigate farmers' groups, how farmers create and share local and external knowledge or how they manage information. The present study adopted some of the methods used by Garforth (2001a; 2001b; 2001c), including PRA, questionnaires, semi-structured interviews and observation.

The Bagnall-Oakeley and Ocilaje's (2002) study in Uganda examined AKIS and local information systems and addressed communication channels, local knowledge and ICTs. This study showed that NGOs and other organisations had a wealth of knowledge and experience that was beneficial to farmers. This study also demonstrated the role of ICTs such as radio and cellular phones in communicating agricultural information. Bagnall-Oakeley and Ocilaje's (2002) study showed challenges with radio broadcast schedules, listenership numbers, poor timing and language, and pointed out that the cell phone had limited coverage and was considered to be expensive by most farmers. This study developed and tested a methodology for mapping and understanding farmer's local agricultural knowledge and information systems (Bagnall-Oakeley *et al.* 2004). Comparisons of cases studies in Eritrea and Uganda revealed that information coming from external sources brought in opportunities, awareness and fresh ideas, which stimulated new thinking in their communities (Garforth, Khatiwada and Campbell 2003). Findings by Garforth, Khatiwada and Campbell (2003) showed variations in the communication channels used by men and women, and in the use of TV, video, phone, newspapers and radio. The present study investigated the different communication channels for sharing and exchanging agricultural information and knowledge in Kirinyaga district, Kenya, and the role of traditional and modern ICTs.

Worth's (2002:476) research was slanted towards extension and focused on the development of an extension and learning model for smallholder agriculture in South Africa, arising out of new thinking about extension. This theoretical study aimed at developing a clear framework to guide decision making, and the strengthening of capacities of agricultural actors (Worth 2002; 2006). Worth's study led to the development of a theoretical model – Agriflection, which focused on resource poor small-scale farmers, and supported partnerships and collaboration as emphasised by AKIS (Worth 2002:478). The study showed that AKIS models provide the basis on which to understand relationships between learning and extension (Worth 2006). Agriflection in particular viewed farmers as active participants of change and explained the nature and purpose of relationships between key actors (farmer, research and extension) and policy. The study recommended an approach based on a continuous learning culture, focusing on the knowledge assets of small-scale farmers, their needs, the available technical options, and methods and systems of continuously engaging the key actors (Worth 2006:180). However, Worth's (2002; 2006) study was theoretical in nature and the model developed had not been tested.

The AKIS study by the LinKS project in the Southern Highlands of Tanzania addressed the relationships of gender roles and local knowledge systems in strengthening agricultural and rural development, and the knowledge and communication processes (FAO LinKS Project 2003; FAO Noragric LinKS Project 2004). LinKS used a mix of qualitative, quantitative and participatory

methodology, and similar methods to those used by Bachmann (2000) as well as participant observation to investigate local knowledge and communication systems in the seed sector. LiNKS also adopted the AKIS framework that the FAO has been promoting to study the gender dimensions of knowledge and communication processes, by pursuing sources and channels of knowledge to facilitate communication and mutual learning among different actors in Tanzania (FAO LinKS Project 2003). A unique aspect of this study was the focus on gender differentiation (FAO LinKS Project 2003; FAO Noragric LinKS Project 2004). This study showed the important role of the local knowledge of women and men in conserving and managing agrobiodiversity for food security, and the importance of documenting local knowledge (FAO LinKS Project 2003). The present study adopted a similar methodology and methods as those used by the LiNKS project. However, the present study used unobtrusive observation in place of participant observation to complement the other methods. Borrowing from the foresight of the FAO LinKS Project (2003), the present study incorporated some gender aspects by investigating the roles of men, women and the youth in the study of AKIS.

Stefano *et al.*'s (2005a; 2009) study investigated the AKIS of resource poor organic smallholder farmers in KwaZulu-Natal, South Africa. The study used action research, RAAKS, PRA, action learning, narrative, cultural probes and the photovoice technique to identify local and external knowledge and information required to support production and marketing of organic produce by small-scale farmers, and explored ways to link farmers' traditional agricultural knowledge to relevant internal and external knowledge and information sources and channels. Preliminary findings of this study showed that farmers used local knowledge and external information and largely shared this knowledge and information orally. The poor telecommunication infrastructure in the area limited the use of phones and other ICTs. Like Bachmann (2000) and Stefano *et al.* (2005a; 2009), the present study used action research to study the AKIS of small-scale farmers in Kirinyaga district.

Moussa's (2006) study in Benin analysed the impact of a private delivery and financing system on the management of information and knowledge on the Lutte Etagée Ciblée (LEC) technology to control *Helicoverpa armigera* (cotton pest). This study provided evidence that the delivery and financing systems involved multiple actors, and that farmers considered information to be a public good. Moussa (2006) observed a decrease in demand for services and knowledge where a fee was charged for service or information. A key recommendation of this study was enhanced communication among stakeholders, and participation of key actors (including farmers) before designing private delivery systems.

#### 4.6.3 AKIS studies from Kenya

A number of studies on AKIS have been conducted in Kenya using different methodologies and methods (Den Biggelaar and Mugo 1996; Ndungu, Nkonge and Rees 2000; Rees *et al.* 2000; Hooton *et al.* 2006; Karanja and Ouma 2006). In order to study the linkages between actors, Den Biggelaar and Mugo (1996) studied the agricultural knowledge system in Embu district, Eastern and Central provinces, Kenya. The study aimed at developing and testing a collaborative model for the promotion of agroforestry technologies in humid and semi-arid lands. Unlike the FAO and The World Bank (2000) model that included research, extension, education and farmers the study by Den Biggelaar and Mugo (1996) focused on the inter-linkages between research, extension and farmers, and how they create, transform, disseminate and receive information.

The study also investigated flows of information and linkage mechanisms connecting them. The study used qualitative methodology, and used RAAKS, interviews, focus group discussions and questionnaires to collect data. Den Biggelaar and Mugo (1996) ignored the knowledge component (local and external), and therefore the study was limited in the sense that it focused only on information. Findings of this study were confirmed by research conducted later by Ndungu, Nkonge and Rees (2000), Rees *et al.* (2000), Hooton *et al.* (2006), and Karanja and Ouma (2000), which showed that farmers were weakly linked to multiple actors through a spider web of linkages. This study also suggested that efforts towards developing a model were “work[s] in progress,” because AKIS actors needed to change and align with the dynamic circumstances and conditions in the environment. The study recommended that an AKIS model should factor in continuity of linkages and integration of actors in a knowledge and information system by providing some measure of stability, continuity and coordination in the rural development agendas. The present study used a multiple methods research design, which included qualitative, quantitative and participatory methodologies, and like Den Biggelaar and Mugo (1996) adopted RAAKS, interviews, questionnaires and focus group discussions, and other complementary methods.

A study by Ndungu, Nkonge and Rees (2000) on the AKIS of Trans Nzoia and West Pokot districts in the Rift Valley province investigated information pathways and flows and assessed the different actors involved in dissemination of agricultural technologies. The study used PRA, RAAKS, and strengths, weaknesses, opportunities and threats (SWOT) analyses to collect data and the study findings were in line with those of Den Biggelaar and Mugo (1996). The study by Ndungu, Nkonge and Rees (2000) established that linkages between actors were weak, and technology transfer mechanisms were poor. Further, this study identified the Ministry of Agriculture, followed by NGOs, and interactions between farmers, neighbours and friends as the main sources of agricultural information. Other important sources included CBOs, mass and print media. In terms of gender, the study revealed that in some areas, men, women and the youth used different sources of information,

and different categories of farmers used different types of information depending on the farming system they used. Contrary to findings by Rees *et al.* (2000:2), stockists and traders were not considered important sources of information in Trans Nzoia and West Pokot districts.

Rees *et al.*'s (2000) study assessed the significance of different actors and organisations as potential uptake or dissemination pathways for agricultural technologies in Kenya, and considered ways of improving the performance of the knowledge and information systems in four districts (Kiambu, Homa Bay, Trans Nzoia and West Pokot), which included high potential and pastoral areas. The study targeted small-scale farmers, CBOs and local agricultural actors. Using similar data collection methods as those used by Boonekamp *et al.* (1996:311-312) and Ndungu, Nkonge and Rees (2000), data was collected from key informants, individual farmers, research, extension, education and the private sector institutions. Findings of the Rees *et al.* (2000) study concurred with those from earlier studies (Den Biggelaar and Mugo 1996; Bachmann 2000; Ndungu, Nkonge and Rees 2000), and subsequent studies in Kenya and beyond (Garforth 2001a; Bagnall-Oakeley and Ocilaje 2002; Rivera, Qamar and Mwandemere's 2005).

The Rees *et al.* (2000) study revealed that the AKIS of smallholders was complex, diverse and varied from district to district, with agroecology and agricultural enterprise. The study established that farmers were keen to learn through direct interaction with researchers and extensionists. Links between external institutions and organisations for government and NGOs were weak and poorly coordinated. The main sources of knowledge for small-scale farmers identified by the Rees *et al.* (2000) study were neighbours, family, markets and CBOs, government extension services, as well as NGOs, churches, traders, stockists and the chief's *barazas*. The study recommended the use of networking and strategic alliances with other agencies such as farmers' groups in the provision of services and emphasised the importance of participatory learning approaches. This study did not go in-depth into the information needs and information behaviour of farmers, the role of ICTs and the management of knowledge and information. The present study focused on small-scale farmers' groups and identified the needs of farmers and their information behaviour, the role of ICTs in accessing agricultural information and knowledge, and existing practices for managing agricultural knowledge and information in Kirinyaga district.

Davis (2004; 2006) examined the role that farmers' groups played in disseminating dairy-goat technology in Meru Central district, Kenya. The target population was small-scale farmers involved in dairy-goat groups. The methods used to collect data included questionnaires, interviews, documentary analysis, participant observation, social mapping and timelines. This study showed that there were different reasons for participation in groups and variations between groups based on gender, age, group purpose and membership in other groups. A key recommendation of this study

was the need to investigate the role that agricultural actors played in managing agricultural knowledge, information and resources among small-scale farmers. The present study focused on farmers' groups and incorporated a component on managing agricultural knowledge and information.

The study by Hooton *et al.* (2006) centred on Kenya's dairy sector, which is predominantly smallholder, and investigated how an improved KIS could support productivity and livelihoods. This study gathered qualitative data using the RAAKS, workshops, key informant interviews and semi-structured interviews in Kiambu, Nakuru and Vihiga districts. Like earlier studies, the findings of Hooton *et al.*'s. (2006) study showed that despite the large number of actors that generate and disseminate information, the coordination of the knowledge system between the actors was weak, and the sharing of information was generally informal. Another key finding of this study was that the dairy sector information services were demand-driven, and targeted market oriented sub-sectors. This could explain why most dairy farmer smallholders interacted mainly with input and output actors in the private sector.

Further, the study revealed that farmers' groups (including co-operative societies) were the main entry points for service providers, and the groups were "active and innovative seekers of information." Respondents in this study perceived information centres as having the potential of acting as hubs for the sharing of information to the different dairy industry actors. The findings of Moussa's (2006) study in Benin, were similar to Hooton *et al.*'s. (2006:546), and showed that farmers were reluctant to pay for information services. Unlike Den Biggelaar and Mugo (1996), and Hooton *et al.* (2006) who adopted a sectoral approach, the present study focused on the holistic needs of small-scale farmers by focusing on agriculture in general.

The AKIS study by Karanja and Ouma (2006:194-195) investigated linkages among agricultural actors, the kind of information and knowledge they shared and the adoption of technologies under different uptake pathways in two divisions representing high potential and low potential areas in Meru Central district, Eastern Province. Qualitative data was collected using interviews with farmers, group discussions with key informants who identified the agricultural actors, interviews with representatives of the main actors. Like previous studies on AKIS (Den Biggelaar and Mugo 1996; Ndungu, Nkonge and Rees 2000; Rees *et al.* 2000; Hooton *et al.* 2006), findings of the Karanja and Ouma study showed that there were many actors involved in the generation, sharing and utilisation of technologies that had not been systematically addressed. The authors observed weak linkages between actors, and noted that there were more agricultural actors in the high potential areas than in the low potential areas.

Findings by Rees *et al.* (2000:4) suggested that linkages between actors were brought about by activities such as service and market linkages. These findings were in conformity with those by Den Biggelaar and Mugo (1996), who pointed out that the linkages, depended on the rural development and project activities within the area. Contrary to these findings, Karanja and Ouma's (2006:195) findings suggested that linkages between different actors of the knowledge systems were dependent on the project life cycle. Like previous studies in Kenya, and Africa in general (Den Biggelaar and Mugo 1996; Garforth 2001a; 2001b; 2001c; Rees *et al.* 2000:4; Stefano *et al.* 2005a; Karanja and Ouma's 2006), the study by Kiptot *et al.* 2006) showed that a good understanding of the links and the sources of agricultural information and knowledge was essential in planning for interventions to improve information exchange and AKIS. The study established that farmers largely obtained agricultural information from other farmers (farmer-to-farmer), and recommended the strengthening of existing collaborative forums to include more actors. The present investigation thus aimed to obtain a good understanding of the linkages in terms of strength and quality, and sources of information and knowledge of small-scale farmers in Kirinyaga district.

The study by Kiptot *et al.* (2006) investigated the social processes of the farm and the farmer in Siaya and Vihiga districts in Western Kenya, and dealt with informal social networks. The study looked at the characteristics that influence the dissemination of seed and knowledge on two agroforestry technologies. The study was carried out through formal and informal surveys. The study demonstrated the use of random and non-random sampling methods in an AKIS study. The study findings revealed that informal social networks such as farmer-to-farmer dissemination played a key role in disseminating agricultural technologies. According to Kiptot *et al.* (2006), agroforestry seed and knowledge in Vihiga and Siaya districts were largely shared along kinship lines. The authors recommended that there was a need to repackage and simplify technical information to suit the needs and levels of understanding of farmers. The present study attempted to address some of the inadequacies identified in the above studies. The present study focused on small-scale farmers' groups and addressed agriculture in a broad sense as opposed to the sectoral approach. The study also addressed the management of knowledge, information and the role of ICTs in the AKIS of Kirinyaga district, Kenya.

#### **4.7 The key thematic areas addressed by the study**

Aubrac (1977) asserted that increased productivity in the agricultural sector is crucial and needs to be underpinned by agricultural knowledge and information. Aubrac (1977) posited that there was a cause-effect relationship between the lack of information and slow development of the agricultural sector. Considering the importance of information and knowledge in the AKIS framework, scholars have raised many important questions (see **section 1.2**), which correspond to the objectives of the present study. The following section of the literature review addresses six major thematic areas



namely i) information needs and information seeking behaviour; ii) sources of knowledge and information; iii) linkages and flows of knowledge and information (including the role of ICTs); iv) usage of knowledge and information; v) barriers to accessing knowledge and information; and vi) managing agricultural knowledge and information. In addition, this section reviews some of the AKIS models developed by earlier authors. The present study was designed to investigate these six themes to help understand the AKIS of small-scale farmers and the linkages between key actors and to propose an AKIS model for small-scale farmers in Kirinyaga district.

#### **4.7.1 Information needs and information seeking behaviour of key actors**

In scope, information behaviour includes i) information need and factors that produce a person's perception of need, ii) factors that affect the response of the individual's response to the perception of need and iii) those processes or actions that are involved in the response (Wilson 1997a:39; 2000) (see definition of key terms in the preliminary pages). Information seeking also includes the totality of passive and purposive behaviours that do not involve seeking, such as actively avoiding information (Case 2002:5). In sum, information behaviour covers information seeking behaviour, and comprises the concepts information need, information seeking and information use (Wilson 1999:249; 2000). For Wilson (1999:249), information seeking behaviour involves "those activities a person may engage in when identifying his or her own needs for information, searching for such information in any way, and using or transferring that information." It is the "totality of human behaviour in relation to sources and channels of information."

Information needs arise when an individual is in a problem situation and cannot manage with the knowledge possessed (Talja 1997:72). As explicated by Case (2002:83), information seeking may not always be triggered off by the need to solve a problem or make a decision because at times, one may merely desire to have more information or assurance or wish to reduce uncertainty. All people (including farmers) have a right to accessible information and more so the rural communities (Abid 1995:11; Meyer 2000; Anderson and Feder 2004:43). Men and women need information and are receivers and communicators of information (Mchombu 1999:212). Alex *et al.* (2002:3) also observed that agriculture was gradually becoming commercialised and modernised, and noted that this change would affect the nature of farmer information needs. In this regard, Stefano (2004:52) pointed out that information and knowledge provided to small-scale farmers should be based on their current needs. The present study investigated the information needs and information seeking behaviour of small-scale farmers in Kirinyaga district.

##### **4.7.1.1 Information needs of small-scale farmers**

There has been increasing interest in needs assessments relating to farmers (Kaniki 1989; 1994a:53; Ojiambo 1995:117; Kiondo 1998; Scarr *et al.* 1999:573; Rosenberg 2001; Lesaoana-Tshabalala 2003;

Mchombu 2003; Meyer 2003a; Chipeta 2004; Stefano 2004; Stefano *et al.* 2005a; Kalusopa 2005; Tire 2006; Kwake 2006; Bawden 2006; Wilson 2006a). Rosenberg (2001:19) asserted that to satisfy “information needs,” an information service must respond to the real and current needs of people. Farmers need information because like land, labour and capital, information is one of the key production factors (Leckie 1996:298). Further, various authors (Colle and Roman 2003:42; Mchombu 2004:34; Bringe 2008:24) emphasised the need to involve community beneficiaries in determining their information needs, and argued that such communities were best placed to know what their needs were, what their resources were, and what direction they wanted to pursue. Empirical evidence from various studies suggested that information needs of rural communities were broad and diverse due to the interdisciplinary nature of agriculture and included other development and social information (Aina 1995:203; Ojiambo 1995:118; Kaniki 1995a:30; 1995b; Kiondo 1998; Kayabwe and Kibombo 1999:12-13; Munyua and Adupa 2002; IDRC 2004; Nyankanga *et al.* 2004:143; Byamugisha *et al.* 2008:97; Chilimo 2008:262).

Abid (1995:12) and Alex *et al.* (2002:1-2) reiterated that in addition to agricultural related information, rural communities need information on health, education and skills, problems of daily existence, government and society, tourism and recreation and leisure among others. In addition to technical information (including information on the indigenous techniques of communities) (IFAD 2002b:84), scholars have established that agricultural stakeholders need information on commercial aspects (including markets), post-harvest handling, standards, pests and diseases, agroforestry and agricultural implements or machinery, weather, early warning mechanisms, credit, socio-cultural and legal aspects (Aina 1990; Kayabwe and Kibombo 1999:12-13; Munyua and Adupa 2000; Weiss, Van Crowder and Bernardi 2000:185-186; IFAD 2002b:54; Chipeta 2004:6; IDRC 2004; Pretty and Wesseler 2004:9; Davis, R. 2006; Matovelo, Msuya and De Smet 2006:259). In addition, Chisenga, Entsua-Mensah and Sam (2007:7) found that farmers need information on competing imports, incentives and government policies. Nevertheless, it was noted that needs were contextual and were influenced by location, target group or social setting (Kaniki 1989:73; Mchombu 1992; Kiondo 1998:247; Mchombu *et al.* 2001:187; Mutua-Kombo 2001; Ikoja-Odongo and Mostert 2006:153,156). Ojiambo's (1989 cited in Ojiambo 1995:118) study in Kenya showed that farmers needed information on better farming methods, fertilisers, crop husbandry, credit and marketing, and animal husbandry. A study by Wiemer *et al.* (1997) showed that the priority information needs of farmers in Kenya included metadata on sources of information, market prices, food security forecasts, technical production, irrigation and inputs, weather, credit and agroprocessing. Further, the study by Davis, K. E. (2006) in Meru district, Kenya noted that often, small-scale farmers entering high value agriculture (HVA) products needed technical support to comply with quality standards.

An agricultural needs assessment study of 13 institutions in Kenya (government, universities, NGOs and the private sector) showed that the key information service providers had multiple roles with varied needs. Generally, the main needs included information on funding, risk management, networking and partnerships, market information, agroprocessing, standards and regulations and intellectual property rights (IPR) (Njeru, Gitonga and Machira 2008). Despite the many needs assessments conducted in some countries, the literature suggests that the current needs of farmers have not been met. For instance, Wilson (1981b; 2006a; 2006b:658) lamented that the area of information needs had not yet been fully addressed, and stressed the need for conducting in-depth investigations of target user groups. Scholars have also pointed out that information needs are dynamic, hence there is a need for conducting regular needs assessments to cope with the changing needs of farmers (Kaniki 1989:73; Oettie and Koelle 2003:12; Bawden 2006). In addition, Easdown and Starasts (2004) pointed out that in Australia, there was a mismatch between current information on the internet that was aimed at farmers and the way the farmers made decisions. Information providers thus needed to target the needs of specific communities (Kaniki 2001:190), and as already emphasised by Rosenberg (2001:19), information sources needed to respond to the needs of the people. The present study carried out in-depth interviews to assess the current knowledge and information needs of small-scale farmers in the four divisions of Kirinyaga district.

#### **4.7.1.2 Information seeking behaviour of small-scale farmers**

Information seeking behaviour is complex, experiential and entails solving a problem or filling an information gap. As already defined by Wilson (2000) in the definition of key terms in the preliminary pages, information seeking behaviour is purposive and aims to “satisfy” a need or goal. Studies have revealed that small-scale farmers have different seeking behaviours. For instance, Mchombu (1993), pointed out that most women obtained information from friends, relatives and village leaders. He observed that where resource centres had been established, men tended to dominate the centres. Oladokun’s (1994) study suggested that the agricultural information needs of women in agriculture in Nigeria were similar to those of male farmers. According to Oladokun (1994), female farmers were more likely to employ modern farming methods than men, and their information needs had not been met. Their main sources of information were personal contacts and cooperative societies. Linked to gender issues, a study by Kiondo (1998) in Tanzania revealed different information seeking patterns between women in rural areas and those in urban areas. In addition, the LinKS project in Tanzania promoted the gender dimensions of knowledge and communication processes by pursuing gender differentiated strategies to facilitate communication and mutual learning among different actors and genders (FAO LinKS Project 2003).

Studies have shown that rural communities prefer oral inter-personal information (Leach 2001a:54,60; 2001b; IDRC2004), because it provides for two way communication and interaction, which led to clarity. Nevertheless, Leach’s (2001a:61) study considered oral communication to be

inadequate and the print format was regarded as complementary. This finding was consistent with empirical evidence provided by Chaka (2003:65) and Stefano *et al.* (2005b:59) in South Africa, Matovelo, Msuya and De Smet (2006:260-261) in Tanzania, and Muyinza and Agona (2006:236) in Uganda. These studies showed that small-scale farmers preferred to access print agricultural materials in their own local languages. Focusing on radio, a study by Morgan (1993) on listenership patterns in Kenya indicated that women preferred easily understood programmes that were interesting and relevant.

There were varying patterns on the use of the internet, and Easdown and Starast's (2004) study on the use of the internet by farmers in Australia identified a number of elements that affect the information seeking behaviour of farmers, including the contexts of individual farmers, the value of information, the education level, and the availability and accessibility of information. In addition, various authors (Rees *et al.* 2000:4; Stefano *et al.* 2005b; Morris 2007:23) found that farmers preferred to use sources within their proximity. In India, knowledge verified by scientists on groundnut shell manure was shared with other farmers through experimentation (Maruthi and Srinivas 2006:3). The information and knowledge shared facilitated the diversification of enterprises and the adoption of high value commodities (Mishra and Swanson 2009:339,341). As emphasised by Swanson (2009:2), there was a need to focus on increasing farm incomes through "intensification and diversification." The present study investigated the information seeking behaviour of small-scale farmers in Kirinyaga district, Kenya.

#### **4.7.2 Sources of knowledge and information**

Farmers used various criteria to determine the importance of sources including usefulness and reliability (Owens 1997:332); quality of information such as relevance (Kiondo (1998:222; Thysen 2000:301; Salaün and Flores 2001:24,27; Bokhari 2005; Llewellyn 2007:149,152); accuracy, ease of use, timeliness, back-up and readability (Storer, Thunder and Murray-Prior 2001); the cost of information (Weiss, Van Crowder and Bernardi 2000:185; Garforth *et al.* 2003:4; Zhao, Zhang and Klein 2009); follow-up or backstopping by the information provider (Lewis 2008:300); accuracy of information (Storer, Thunder and Murray-Prior 2001); time taken to find information, reliability, trustworthiness and understandability (Salaün and Flores 2001:24,27) and accessibility (Oyedele and Yahaya 2009:173). The literature suggests that most small-scale farmers obtain agricultural information from diverse sources (Kaniki 1989; Aina 1995; Ndiaye 1995:115; Bembridge and Tshikolomo 1998:24; Koutsouris and Papadopoulos 1998:89; Rees *et al.* 2000; Best *et al.* 2005; Stefano *et al.* 2005b; Karamagi Akiiki 2006). These sources, which include individual and collective choices and were shaped by the past, and were the main mechanisms for survival in the dynamic conditions (Röling and Wagemakers 1998:3-4). For Zimmerman (2008:142), the voices of the past provided lessons for the future. The past provides useful insights that "surpass the passage of time"

that are relevant in the present time despite the change in time, players and issues. As pointed out by Mugenda and Mugenda (2003), information and knowledge emanates from research, experience, tradition and authority. While some of the sources used were formal, others were informal (Best *et al.* 2005).

The majority of the rural population relied on local knowledge that had been passed on to them from older generations (Mchombu 1993; Ngulube 2002:95; Nyumba 2006), and on personal experiences (Adomi, Ogbomo and Inoni 2003). As an example, the people of Kenya have used indigenous plants over many generations, and have amassed a wide knowledge and experience (Ibui 2007:261).

Knowledge about this informal resource is largely tacit, gained from experience and tradition and is mainly held in the heads of farmers. Other sources include the local community, which Sturges and Neill (2004:53,208) noted was “rich in agricultural knowledge.” Informal interpersonal sources of knowledge and information for small-scale farmers included colleagues and friends, elders, family and neighbours (Leckie 1996:303; Rees *et al.* 2000; Suvedi, Lapinski and Campo 2000; Noordin *et al.* 2001:518; Bagnall-Oakeley and Ocilaje 2002; Garforth *et al.* 2003:3; Solano *et al.* 2003:9,817; Pokhrel and Thapa 2007:161; Sambodo 2007:169; Byamugisha *et al.* 2008:97), and farmers’ own knowledge and experience (Steiner 1998:195-196). As pointed out by various authors (Rees *et al.* 2000:4; Stilwell 2002:75; Solano *et al.* 2003:5,7; Stefano *et al.* 2005b; Morris 2007:23), most farmers preferred interpersonal sources. In addition, most women obtained information from friends and relatives (Mchombu 1993; Ngimwa, Ocholla and Ojiambo 1997:53; Kiondo 1998:209; Chan and Elder 2001:38-39).

Other sources of agricultural knowledge and information included community leaders and rural elders (Abid 1995:12-13; Lewis 2008:297-298; Kanté *et al.* 2009:289), some of whom had considerable influence and power; barazas (Bachmann 2000:107; Rees *et al.* 2000; Davis 2004); schools (Abid 1995:12-13; Noordin *et al.* 2001); local and other larger markets (Abid 1995:12-13; Dijkstra 1996:27; Lightfoot and Scheuermeier 2006:6; Pokhrel and Thapa 2007:161; Sambodo 2007:169; Tijani and Yano 2007:197,198; Byamugisha *et al.* 2008:97; Lightfoot *et al.* 2008:13); religious institutions (Abid 1995:12-13; Rees *et al.* 2000); fellow farmers (Ndungu, Nkonge and Rees 2000; Rees *et al.* 2000:5); and farmers’ groups (Noordin *et al.* 2001; IFAD 2002b; Tengo and Belfrage 2004; Hooton *et al.* 2006:547).

Among the important formal sources of information used by small-scale farmers were government departments (in particular the Ministry of Agriculture extension services) (Abid 1995:12-13; Kimenye 1998:206; Bachmann 2000:105; Ndungu, Nkonge and Rees 2000; Mutua-Kombo 2001; Bagnall-Oakeley and Ocilaje 2002; Anderson and Feder 2004:42; Giné 2005; Daudu, Chado and Igbashal 2009:47; Kibaara *et al.* 2009:51). However, according to Dutta (2009:49), most farmers in developing

countries did not rely heavily on extension services because some extensionists were not qualified and were not knowledgeable on modern farming techniques. Other important sources included cooperatives (Neubert *et al.* 2007:44; Chambo 2009:10); NGOs and CBOs (Abid 1995:12-13; Petersen 1997; Ndungu, Nkonge and Rees 2000; Rees *et al.* 2000; Noordin *et al.* 2001:518; Tengo and Belfrage 2004; Stefano *et al.* 2005b:59; Jensen, English and Menard 2009:4); associations (Chisenga, Entsua-Mensah and Joel 2007:8); researchers (Lewis (2008:300), although some farmers argued that they did not follow-up on projects they initiated with farmers; print materials (Bachmann 2000:105; Stefano 2004); and private organisations and development agencies (Abid 1995:12-13; Pinard 1996; Rees *et al.* 2000; Klerks and 2009) as well as horticultural exporting companies (Meyer 2000:156; Kimenye 2005:153; Agricultural Cooperative Development International and Volunteers in Overseas Cooperative Assistance (ACDI/VOCA) project 2009; Minten, Randrianarison and Swinnen 2009:11732-733).

Other important information sources were private extension services (NAADS 2006; Nyambo and Nyagah 2006:10; Kibaara *et al.* 2009:51; Nyambo *et al.* 2009:100); input suppliers (Rees *et al.* 2000; Bagnall-Oakeley and Ocilaje 2002); the media (radio and TV) (Bachmann 2000:105; Giné 2005; Daudu, Chado and Igbashal 2009:47), which were a major source of information on new technologies, ideas and experiences (Solano *et al.* 2003:9,17; Bringe 2008:44; Ha, Okigbo and Igboaka 2008:400-401) and field days (Kilpatrick (1999:19; Amudavi *et al.* 2009:232-233). The main sources of market information included markets, neighbours and other farmers, cooperatives, associations, farmers' groups, media and intermediaries (Bagnall-Oakeley *et al.* 2004:123; Davis 2004:186; Ferris, Engoru and Kangazi 2008:7). However, although cooperatives were important, Tijani and Yano (2007:197) found that they were dominated by male farmers. Along the same lines, Barham and Chitemi (2009:57) noted that groups with a higher male: female ratio leadership had better access to better markets and contacts, suggesting that groups led by female leaders were disadvantaged.

In Africa, community libraries and information or resource centres or public access centres or libraries were generally considered useful sources of information (Mchombu 1993; Correa *et al.* 1997; Kiondo 1998:217; Rosenberg 2001:11; Stilwell 2001a:200; Colle and Roman 2003:31; Mchombu 2004:33; Munyua 2003:47-48; Sturges and Neill 2004:195; Aitchison 2006; Mchombu and Cadbury 2006:6; Ocholla 2006; Aina 2007:4; Ha, Okigbo and Igboaka 2008:403; Idiegbeyan-Ose and Akpoghome 2009:027; Stilwell and Munyua 2009), which ensured inclusion of all members of the community (Stilwell 2002:67,73,76). A study by Ha, Okigbo and Igboaka (2008:403) in rural Nigeria showed that the concept of knowledge centres equipped with broadband technology was effective in disseminating knowledge among rural farmers. Farmers often make decisions on what sources of agricultural information and knowledge to use, and the face-to-face sources, radio, audio tapes, print, TV, video and internet-based sources form an information ecology that needs to be understood.

However, Ojiambo's (1989 cited in Ojiambo 1995:123) study in Kenya showed that there were very few libraries and documentation centres in Kenya providing agricultural information for farmers. A few NGOs including ALIN-EA and AfriAfya, and projects had established public access points, knowledge centres and techno centres in rural areas (Munyua 2007). Despite their importance, ownership and sustainability of the centres were key challenges (Peters and Austin 1994; Munyua 2003). Rosenberg (2001:12) observed that some of the centres in Africa were run down and had outdated resources. Besides, the percentage of people using the information resources was very low (Munyua and Adupa 2002). Further, some authors have pointed out that the available information for farmers was not well packaged (Abid 1995:13; Stilwell 2001b; Stefano *et al.* 2005b; Madukwe 2006). In addition, resource centres needed to cater for the special needs of female farmers (Mchombu 1999), and to have flexible opening hours to enable farmers to access information. For example, the Bangprok boat library in Thailand (Ahmed 2009:508) remained open after the official working hours, which enabled community members to access information that they needed (Ahmed 2009:508). The present study identified the key sources of agricultural information and knowledge for small-scale farmers in Kirinyaga district, Kenya.

Diverse users obtained agricultural information and knowledge from various sources of information (Aina 1995:1; Thompson 1998) including farmers, policy makers and planners, researchers, extensionists, educators and agro-processors (Aina 1995:1), cooperatives, agribusiness, government organisations, young farmers and students (Thompson 1998; Noordin *et al.* 2001). The users needed different types of information from the various sources of information, which flowed through different linkage mechanisms and communication channels.

#### **4.7.3 Linkages, flows of knowledge and information and the role of ICTs**

Fowler (1992:3-4) observed that improved communication and interlinkages of the ecosystem have led to interdependence of interests, and thus one could not afford to ignore the interests of any actor. Fowler (1992:7) also emphasised the importance of linkages and pointed out that the impact of each actor was dependent on their external relations and the manner in which they interacted with the different sectors. Focusing on the AKIS, Salomon and Engel (1997a) argued that change was required amongst all stakeholders to introduce new technologies and learning on how to develop and use one another's ideas. A major lesson learned by Salomon and Engel (1997a) from their experiences of working independently of each other, was that there was a need to create effective linkages with all vital stakeholders. Building on this lesson, the IFAD (2002b:6) organisation emphasised that linkages and partnerships between the government, the private sector, international development partners were essential and that the rural poor were potential players in development in rural areas. Likewise, a study by Duvel (2005) stressed the importance of community linkage

structures that coordinate the interests of the community in a partnership relationship. Partnerships were important because interacting with a more knowledgeable and skilled partner helped to increase efficiency by reducing cost (Lele 2010:89) and time.

Engel and Salomon (1997) conceived an AKIS as a “web” that links up the major agricultural actors and avails intermediate outputs such as technologies, expertise, ideas, knowledge and information resources that are relevant to agricultural development. In support of this notion, authors have pointed out that different agricultural stakeholders including individuals, groups, networks and institutions have developed a number of innovative technologies, skills, expertise and approaches that need to be harnessed and shared for improved productivity (South Africa. Department of Agriculture 1995; Engel and Salomon 1997; Pretty and Vodouhe 1997:50; Andima *et al.* 1999:585; FAO 2001; Duveskog, Mburu and Critchley 2002). Through networking, farmers share ideas and equipment, circumvented intermediaries and attracted new traders through economies of scale (Lawson *et al.* 2008:12,19,20). Hoffmann, Probst and Christinck (2007:355) pointed out that farmers and professional researchers had different knowledge and skills, which were complementary, but noted that there was little cooperation between farmers and scientists. They observed that farmers had strengths that were not exploited, and researchers had limitations that needed to be addressed, and that there was little communication and interaction between the two groups.

Empirical evidence suggests that working together yields social capital that is partially a public good that once consumed by one group member, is shared with other members of the group (Taylor 1982) (see **section 3.2.2.3**). Interaction among stakeholders yields sustainability (Röling and Wagemaker 1998:7), harnesses knowledge and information more effectively and efficiently, and yields synergistic effects (FAO and The World Bank 2000). In addition, Madukwe (2006) observed that the new extension approaches had improved linkages and ensured that scientific research outputs reached the smallholders they were intended for. Some of these approaches were directed towards a “learning,” rather than a “teaching” paradigm, for instance the FFS approach (see **sections 2.2.4.2 and 4.5.2**). For Leckie (1996:298), farming required “life-long learning.” This learning mode incorporates demand-driven approaches that increase interactive participation of local people at all levels. Kilpatrick (1999) and Meyer (2000; 2003) emphasised the important role of group training in bringing about learning and in improving linkages. Trust between actors helped to establish sustainable relationships (Kilpatrick and Bell 1998; Lyon 2000:678; Putnam 2001), and facilitated the sharing of resources and reciprocating in social support networks. Trust and mutual understanding between group members developed over time as people got to know more and became more open with each other (Kilpatrick and Bell 1998; ). As pointed out by Putnam (2001), there is more likelihood of working together when people know and trust each other.



Meyer's (2000; 2003) study in South Africa showed that the interaction of people contributed to the building of trust and honesty, which influenced the acceptance of new technologies (Meyer 2000:143,194,199,2005). As pointed out by Cross and Baird (2000:71), people often sought information from friends or colleagues they trusted. The element of trust helped to put the local people who were isolated from external sources of information at ease, thus enabling them to share and exchange knowledge they possessed (Powell 2003:21). Pretty and Wesseler (2004:4) further stressed that trust lubricates cooperation and facilitates interaction with local and external actors. In this regard, Irick (2007) suggested the provision of fora for sharing knowledge, for training and teaching people new concepts. A study conducted in South Africa by Darroch and Mushayanyama (2009:94,104) was based on a model that hypothesised that high levels of satisfaction and trust led to cooperation, which led to commitment. They found that trust was a precursor to cooperation between farmers and actors in the supply chain.

#### **4.7.3.1 Linkages**

Many authors have stressed the need for strong linkages within the AKIS framework (Röling 1988; Asopa and Beye 1997b; Pretty and Vodouhe 1997:50; Salomon and Engel 1997a; Eicher 1999:33; Rivera 2006:59). Röling (1988) emphasised the role of linkages in facilitating the sharing, creating, storing, disseminating, integrating and utilising of knowledge and information in a specific area of operation. Asopa and Beye (1997b) reiterated the need for developing appropriate mechanisms for strengthening linkages between actors. Pretty and Vodouhe (1997:50) summed up the importance of linking the different players and stated that performance and output of groups was likely to be greater than the sum of the individual members. For Eicher (1999:33), the components in the agricultural knowledge triangle play complementary roles in agricultural development, and the performance of one component was dependent on the existing linkages. For example, extension and training services facilitated linkages with farmers and other actors, and improved extension and advisory services (Braun, Thiele and Fernández 2000; Meyer 2000:143,194-199; 2005; Rees *et al.* 2000:4; Carrasco 2001; Garforth 2001a).

According to Salomon and Engel (1997a), a major lesson learned from AKIS studies was the need to create effective linkages with all vital stakeholders. AKIS systems facilitate networking and communication processes among stakeholders in agricultural development (Engel and Salomon 1997). Engel (1997) added that interaction or networking among social actors from relevant social practices led to new solutions and innovation. Improving linkages between stakeholders, and the involvement of farmers in agricultural activities improved learning across all levels and among the different actors (Garforth 2001a; Moussa 2006), and through interactions, group members shared complementary knowledge assets that they possessed (Davenport and Prusak 2000:38-39). For Powell (2003:153), linkages involve the flow of information, and “can and should exist solely for the

exchange of information.” Del Castello and Braun (2006:2) further emphasised that an AKIS should recognise the mutual interdependence among actors, and enhance decision making at all levels in an holistic manner.

Petersen (1997) noted that linkage problems include those resulting from the lack of feedback from farmers and those pertaining to poor coordination and cooperation between actors. For example, Eicher (1999:38) and Rivera, Qamar and Mwandemere (2005:54-55) observed that there were weak linkages between extension and research, training and education institutions. Various authors (Renko, Nikolasevic and Pavicic 2002:543) have shown that linkages between some horticultural exporting companies and farmers were weak due to challenges in the drawing up of contracts, and linkages between farmers and training and education actors were weak (Munyua and Stilwell 2009:12). In addition, Rees *et al.* (2000:2), Garforth (2001) and Davis (2004:187,195) found that there were variations on linkages in different geographical locations. In this regard, many authors have stressed the need for strong linkages between actors (Salomon and Engel 1997a; Kiplang'at and Ocholla 2005:245; Rivera 2006:59).

As explained in **Chapter one** and **section 4.1** above, components of an AKIS are determined by the functions and linkages between the flow and feedback of technology and information, which may include agricultural research organisations, extensionists, commercial companies and NGOs. An AKIS could be used to discover linkages of social actors in the agricultural sector to create, adapt, share, store and apply knowledge and information (Röling and Wagemakers 1998:16; Del Castello and Braun 2006:2). Low agricultural productivity in many countries has been attributed to poor linkages between research-advisory service-farmers and to technology delivery systems that were not effective (poor information packaging, inadequate communication systems and poor methodologies (Del Castello and Braun 2006:1). Jones (2006) asserted that linkages yield harmonisation, synergy and add value to the efforts of the different actors. This assertion was supported by Rege (2006:222), who stressed the importance of public-private partnerships and intersectorial linkages in the development of agricultural information systems. Partnerships enhanced access to research outputs and current information (Gianatti and Carmody 2007:166-171). As recently pointed out at the GCARD conference, “enabling the system as a whole to deliver real improvements requires ‘joined-up thinking’ across the board, with all the components working together to produce a better and more effective result” (Lewis 2010).

Asopa and Beye 1997b referred to several mechanisms developed by the International Service for National Agricultural Research (ISNAR) for strengthening linkages, which were categorised under management and organisational. Some of the structural and organisational mechanisms include combining research and extension functions, decentralising research and extension activities,

employing subject matter specialists, introducing research-extension liaison officers, forming information and communication departments, establishing committees, agreements for collaboration with and the inclusion of farmers in research activities. Zuidema (1988:12) identified six principles of linkages namely i) effective participation - the groups or institutions should share a common purpose or domain consensus, ii) the actors should perceive the advantages of participating in linkage activities, iii) there should be proximity to facilitate collaboration, iv) linkage activities of the different actors should be compatible, v) there should be individual incentives for working together, and vi) there should be effective communication between members from different groups or components and two-way flow of information.

Linkages between actors are determined by ways of communication and communication channels and may be i) formal<sup>37</sup> or informal,<sup>38</sup> ii) top down or bottom-up, iii) internal<sup>39</sup> or external<sup>40</sup>, or iv) downstream or upstream linkages<sup>41</sup> (Stoop 1988:3,5-6). Rees *et al.* (2000), Pretty (2003a:27) and Pretty and Wesseler (2003:5) referred to horizontal<sup>42</sup> and vertical<sup>43</sup> linkages between actors. For example, groups integrated vertically with processors or export markets (Hennessy 1996:1037) or horticultural exporting companies, contracts or out grower programmes (Bingen, Serrano and Howard 2003:411-412; Kariuki, Obare and Birachi 2006:841), or to external actors (Pretty and Wesseler 2003:5). These exporting companies also provided farm and non-farm linkages, which included backward and forward linkages (Kimenye 2005:158) to inputs and markets. On the other hand, groups may be linked horizontally within the same group of actor (Pinard 1996). For example, some farmers are linked horizontally to sell their produce through marketing groups (Holloway *et al.* 2000:6,18), through cooperatives (Muriuki *et al.* 2003:10; Bernard and Spielman 2009:64; Chambo 2009:3,8-9) and through farmer organisations (Darroch and Mushayanyama 2009:104). Other linkage mechanisms between actors include extension and training linkages, information seeking linkages, service linkages, market linkages, basic needs linkages (Rees *et al.* 2000:4), and research linkages (Kamau 2007:144). Approaches to studying linkages include the ISNAR Research and Technology Transfer Linkage framework, the Agricultural Technology Management System model,

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<sup>37</sup> Formal linkages are those that have been clearly and explicitly specified and agreed upon by the organisations (Stoop 1988:5).

<sup>38</sup> Informal linkages are the non-official person-to-person interactions, based on the need for collaboration between individuals (Stoop 1988:5).

<sup>39</sup> Internal linkages are those connections among scientists working in different disciplines or commodities (Stoop 1988:6).

<sup>40</sup> External linkages are the connections with main actors such as farmers and policy makers (Stoop 1988:6).

<sup>41</sup> Upstream or downstream linkages are part of the external linkages. Upstream linkages occur between researchers and policy makers, donors or regional and international research while downstream linkages occur between researchers and farmers and other producers, extension and private sector (Stoop 1988:3).

<sup>42</sup> Horizontal linkages or flows denote the movement of information and knowledge between different sections of the same actor, for example among members in a farmers' group or an NGO.

<sup>43</sup> Vertical flow denotes the movement of information or knowledge between pairs of actors (top down and bottom up), for example from research to extension or to NGO or training institution.

and the AKIS framework (Asopa and Beye 1997b), which the present study adopted to study linkages using selected windows of RAAKS and PRA tools in probing the dynamics of the linkages of major stakeholders (see **section 5.5.1**).

Various authors have observed that linkages between farmers and extension and research were weak (Bachmann 2000:119-120; Rees *et al.* 2000:3; Kingiri and Ayele 2009:6), and these weak farmer – research linkages act as barriers to accessing research outputs. As pointed out in Chapter two, there were weak linkages between research, extension and farmers in Kenya. Although the Ministry of Agriculture and Ministry of Livestock Development in Kenya played a role in collecting and packaging market information, they were not visible, and the farmers' main marketing linkages were with intermediaries (traders, brokers, hawkers), the private sector, exporters, transporters, cooperatives, depending on the geographic location and enterprise(s) produced (Rees *et al.* 2000). Muriuki *et al.* (2003:43) observed market linkages between farmers and milk processors and marketers such as Brookside and Spin Knit dairies and others. There were also linkages between farmers and farmers' groups and Kamau (2007:154,155) found that farmers in Mwea division in Kirinyaga district obtained information on rice fodder from their group and other farmers. They were feeding their milking cows with rice ratoons and rice plants that were not high yielding for increased milk production. According to UNECA and the African Union (2009:133), agricultural actors were not strongly integrated, linkages with actors in the manufacturing sector were weak, and information on agroprocessing was inadequate.

#### **4.7.3.2 Flows of knowledge and information and channels of communication**

Poole (1985:103) defined an information channel as the medium through which information is communicated, such as a book, person or telephone. Rogers (1983:35) described a communication channel as the “means by which messages get from one individual to another,” and communication as “the exchange of information and the transmission of meaning. For Rölöing (1988:41), communication required shared meaning, and entailed the use of symbols and packages to mobilise and transfer information and skills, and ultimately bring about behaviour change in people. Communication is about helping people to understand needs, assess opportunities and provide them with media and methods to reach a common understanding (Ramirez 1998). Communication has also been described as “organized information flow” (Whyte 2000), or “a set of processes by which information is sought, accessed, exchanged and transferred; knowledge is developed and modified; social capital is maintained and strengthened; and claims on assets are asserted and negotiated” (Garforth, Khatiwada and Campbell 2003). To Del Castello and Braun (2006:4), communication was a two-way process, where words, data or information are sent and received between two or more people or groups of people, whereby the sender and receiver have some common understanding on how the data or information is to be used.

Communication is thus pivotal to sharing the knowledge and information assets of each actor within an AKIS, and for strengthening the linkages between actors. Communication is considered a social process in the agricultural and rural development domain (Del Castello and Braun 2006:3,5). According to Del Castello and Braun (2006:3,5), poor communication is among the causes of most linkage problems between institutional actors, and the lack of involvement of farmers and their organisations. They argued that rural communication<sup>44</sup> could overcome the many challenges of poor linkages. Indeed it has been observed that pluralistic agricultural extension and education approaches have changed the nature of agricultural information in terms of the content, and in the manner in which information is transferred (Rivera, Qamar and Mwandemere 2005:54).

According to Niang (1995:190), the transfer of technology was synonymous with the transfer of knowledge and expertise. As asserted by Davenport and Prusak (1997:3), “the key purpose of information: [is] to inform people.” However, knowledge and information resources can only be drawn on for use if they are communicated and exchanged to satisfy information needs (Drucker 1999; Vikas Nath 2000). As pointed out by Powell (2003:45) it is the flow and exchange of information that determined the use of information and the creation of value. Dervin (2003c:294,307) argued that information can be viewed “as a thing” that can be manufactured, processed or transmitted and “as construction” and both approaches are useful to informing (sense making or meaning making) human beings. Agricultural knowledge and information flows through various channels including the private sector firms, universities, NGOs, agro industries and suppliers of equipment and inputs (Berdegué and Escobar 2001:28). As noted by Smith (2005), there is no single right way of sharing knowledge but rather, knowledge sharing activities are determined by how individuals and groups feel about the process and the network of people they socialised with.

The social ecology approach, which emphasises the perceptions of individual farmers within the environment at multiple levels and the interactions between people and their surrounding social environment places emphasis on the role of individuals, groups and institutions in the flow of information and their cumulative impact on the community (Binder 1972; Stokols 1996; Dimara, Petrou and Skurus 2003:222). For DePaula and Fischer (2005:34-36), ecology connotes evolution and pertains to the interrelationships that facilitate information to flow among members of a social network thus forming information ecologies. Interactions between group members created a support network, which was strengthened and guided by the shared objectives of the group, participation in group activities and rules of the group (Kilpatrick and Bell 1998). For example, Meyer’s (2000:154)

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<sup>44</sup> Rural communication was described as “an interactive process in which information, knowledge and skills, relevant for development are exchanged between farmers, extension/advisory services, information providers and research” (Del Castello and Braun 2006:3).

study in South Africa showed that farmers who had been trained were asked to form their own groups of community members in the vicinity to provide support to each other.

While interactive methods such as friends, community radio and chats permit the reader or listener to respond, non-interactive methods for example books do not provide for feedback (Rivera, Qamar and Mwandemere 2005:60). Different communication channels have been used to communicate agricultural information and knowledge to farmers including traditional channels (Mundy and Compton 1995, Karamagi Akiiki 2006:72); through study tours and exchange visits (Noordin *et al.* 2001:515; Gianatti and Carmody 2007:171); and through ICTs (Richardson 1996; 1999; 2006; Alavi and Leidner 2001:121; Del Castello and Braun 2006:3), which have transformed the manner in which information and knowledge is shared. ICTs facilitate the capturing, processing, storing, and communicating of information (Heeks 1999; Juma and Yee Cheong 2005:49), and the capture, processing, documenting, storage and sharing of knowledge. Farmers use conventional (older) ICTs (print, radio, television, video, fax) and modern ICTs (WorldSpace radio, computers, internet, web-based applications, cellular phone, CD-ROM) concurrently to allow different community target groups to select the communication tools that suit their needs (Colle and Roman 2003:23; Wild 2006) and the type of information needed. The next section discusses the different communication channels and ICTs used to deliver agricultural information to small-scale farmers.

#### **4.7.3.2.1 Traditional communication channels**

Traditional inter-personal channels such as story telling, song, proverbs, drama, dance and song have been used to share agricultural related knowledge and information among rural communities and agricultural actors for many centuries (Mundy and Compton 1995; Grenier 1998; Karamagi Akiiki 2006:72). Stories helped to create mental models which can be applied and interpreted to specific situations or problems being handled, and people tended to remember stories more than facts (Wiig 2004:66,110). Most users prefer oral communication channels (Barkhi *et al.* 1998:224; Kiondo 1998:212; Tshikolomo 1998:25-26; Leach 2001a:57; Best *et al.* 2005; Byamugisha *et al.* 2008:98; Kanté *et al.* 2009:288), because they are locally developed, hence allow for local control; such systems use low end technology hence are cheaper and more attractive (Mundy and Compton (1995:113); and face-to-face communication increases trust and inculcates a “sense of identity” (Hildreth, Wright and Kimble 1999). In addition, many authors (Meyer 2000; Leach 2001a:54) established that rural communities preferred verbal communication, because of the oral traditions and low literacy levels (Meyer 2000; Leach 2001a:54; Stefano *et al.* 2005b:61). As pointed out by Pidatala and Khan (2003:4), most local knowledge in developing countries was shared orally through women who were perceived to be change agents and providers of information and knowledge.

Consultative meetings are also an important communication channel for sharing and exchanging agricultural information and knowledge (Ndungu, Nkonge and Rees 2000:524; Noordin *et al.* 2001:516; Bagnall-Oakeley and Ocilaje 2002; Karamagi Akiiki 2006:75). Group communication methods such as group meetings and FFSs were used because they were more cost-effective in communicating agricultural information than methods targeting individual farmers (Meyer 2000; McClelland, Gartmann and Van Rees 2004:9). A study by Ndungu, Nkonge and Rees (2000:524) in Kenya indicated that the baraza was the most important source of information in rural areas. Sharing knowledge or information through such public gatherings promotes social inclusion (Loimeier 2005:26-27). Small-scale farmers do not need to be literate to use information as it is transferred to them orally (Kiondo 1998; Meyer 2000:209), through friends and relatives, experts and village elders, or through the use of metaphors and storytelling, acting, demonstrations (Tshikolomo 1998:25-26; McClelland, Gartman and Van Rees 2004:2,9), and training (Meyer 2000:160-164,195-196). In Tanzania, farmers' groups in Mgeta in Morogoro shared information on crop protection through training, and shared what they had learned with other farmers through farmer seminars (Mgumia 2001:2,4). The study by Chapman *et al.* (2003:10) established similar findings and pointed out that drama made radio programmes more popular. A study by Stefano (2004:51) in South Africa showed that most farmers acknowledged having been taught to farm by their elders and other community members. According to Stefano (2004), external information was largely delivered through intermediaries such as extension agents, NGOs and researchers.

Noordin *et al.* (2001:515) highlighted some disadvantages of traditional information channels. These included: that sharing channels are expensive and benefit only a few farmers, capturing and storing verbal communication has limitations in that only a few people benefit and once spoken, the knowledge and information risked being lost (Meyer 2002:221). Barazas are rare and their image needs strengthening (Davis 2004:184). While song and dance are useful for sharing agricultural information, they are expensive to mount, may not communicate the message clearly, hence pose problems of trustworthiness (Daudu 2009:23).

#### **4.7.3.2.2 Conventional ICTs**

Older ICTs that have been used to deliver agricultural information include print, radio, television, video, telephone and fax. Radio (Rivera, Qamar and Mwandemere 2005:59; Byamugisha *et al.* 2008:98) and television (Best *et al.* 2005; Stefano *et al.* 2005b:62,64; Kwake 2007:205-206) are perceived to be important communication channels. Past studies have indicated that conventional ICTs such as radio were the most widely used channels amongst rural communities for disseminating knowledge and information. The content was delivered in different languages and formats (Bagnall-Oakeley and Ocilaje 2002; Chapman *et al.* 2003; Girard 2003; Harris 2004). As emphasised by Chapman *et al.* (2003:2,10), the radio was a powerful tool for empowering and communicating

agricultural information to rural and marginalised communities. According to Harris (2004) and Best *et al.* (2005), the radio has attained impressive results in delivering information, and reaches marginalised and illiterate farmers (Best *et al.* 2005; Bobbili *et al.* 2006). A study on rural radio listenership in Meru, Nithi and Tharaka districts in Kenya (Morgan 1993) indicated a penetration of 69% among rural households. Kwake's (2006) study in Kenya showed that radio was the most highly used media and it offers the reach and relevance to listeners by providing them with locally tailored information (in vernacular languages) (Morgan 1993). Likewise, Bobbili *et al.* (2006) found that farmers in Zambia were listening to radio programmes on agricultural problems and techniques and discussing problems and solutions jointly, following which they implemented the various techniques within their local communities. However, Leach (2001a:56) noted that not all people had phones for phoning in and often the lines were congested. Other challenges included synchronising broadcast schedules and timing (Bagnall-Oakeley and Ocilaje 2002; Chapman *et al.* 2003:10), the high cost of airing programmes (Bagnall-Oakeley and Ocilaje 2002; Karamagi Akiiki 2006:71) and the fact that not all people in rural areas had radios (May, Karugia and Ndokweni 2007).

The TV is another important channel for communicating agricultural information (Leach 2001a:56; Chapman *et al.* 2003:4). The TV adds value to radio in that it enables the audience to see and hear. It is this extra quality of seeing that makes the medium more reliable (Leach 2001a:56). The study by Best *et al.* (2005) in Bangladesh ranked TV highly, but pointed out challenges including the lack of electricity infrastructure and TV sets in rural areas. Although in the past rural communities argued that TV did not provide an opportunity for interaction (Leach 2001a:56), today, respondents can phone-in and provide feedback or pose questions. The video is also a powerful tool for transferring agricultural information in rural areas. This tool is popular because it overcomes the barriers of illiteracy, and improves understanding in that the viewer can see the new farming technique (Colle and Roman 2003:10). For dairy farming in Mongolia, farmers relied on TV, followed by village government officials, neighbours and milk stations, cellular phones, agricultural technicians and brochures (Zhao, Zhang and Klein 2009). Most people watched TV as a routine and viewing is affected by the individual's chores, the scheduling of programmes and the need to be physically at home (Westerik *et al.* (2009:34-38).

Studies have showed that the print media (posters, books, manuals, brochures, bulletins, newspapers, journals) is very important for delivering agricultural information to farmers (Kiondo 1998:242; Leach 2001a:55; Morris and Stilwell 2001:73; Munyua and Adupa 2002; Stefano 2004; Rivera, Qamar and Mwandemere 2005:59; Stefano *et al.* 2005b; Karamagi Akiiki 2006:72; Van Den Berg and Jiggins 2007:663; Zhao, Zhang and Klein 2009). The print media is considered more trusted and permanent than oral format (Leach 2001a:55). Empirical evidence from South Africa showed that organic farmers prefer print information that is appropriately packaged in local languages. Despite



their importance, most print materials produced are not easily accessible to farmers. These materials are largely in English, and various authors have pointed out language barriers. In addition, studies have shown that the information available is not appropriately packaged (Kiondo 1998:242; Morris and Stilwell 2001; Munyua and Adupa 2002; Stefano *et al.* 2005b:56; Karamagi Akiiki 2006:72).

As concluded by Ha, Okigbo and Igboaka (2008:400-401), media are crucial in delivering information about new technologies, strengthening networks and facilitating the sharing and exchange of ideas and experiences. Although the media are important, the language used was difficult for farmers to follow and some programmes are not interactive (Best *et al.* 2005) (see **section 4.7.5.8**). Farmers also used modern ICTs for accessing and sharing information and knowledge (Alavi and Leidner 2001:121; Idiegbeyan-Ose and Akpoghome 2009:027).

#### **4.7.3.2.3 Modern ICTs and converged technologies**

New ICTs include a diverse set of technological tools, equipment and services (Torero and von Braun 2006:3) (see definition of key terms in the preliminary pages). A CTA (1996) conference on the role of information for rural development in the ACP countries concluded that new ICTs, particularly electronic networks and digital storage offer faster and better north-south and south-south transfer of information. The FAO's Communication for Development Group (1998) concurred with this conclusion, and emphasised that there is a need to up-grade the knowledge and information of the different agricultural actors. The Communication for Development Group stated that the process of enhancing the knowledge and information base of actors "can be best provided by the effective use of communication technologies." Many authors have pointed out the great potential of modern ICTs in agricultural information systems and knowledge systems, in extension and education as well as in creating knowledge networks (Mehra, Merkel and Bishop 2004:782; Rivera, Qamar and Mwandemere 2005:13,54; Del Castillo and Braun 2006:48; Gray 2010).

The FAO developed FarmNet (FAO 2001) and the VERCON (FAO 2003) (see **section 1.1**). In Australia, farmers' groups (online farmers' groups) are using the internet for receiving online extension services and to access web-based resources. These services have helped farmers to learn from each other and to share information, ideas and experiences that are relevant to their needs (Easdown and Starasts 2004). Mangstl (2008:5) pointed out that although people had used knowledge from various sources to grow crops and raise animals in the past, there were new digital systems that called for a shift in the manner in which agricultural knowledge and information on innovations and markets is shared and accessed by small-scale farmers in developing countries. The FAO and partners launched the e-agriculture initiative to facilitate intermediaries that interact with peasant farmers to access ICTs and share best practices through CoPs (Mangstl 2008:5). In India, the

e-Choupals<sup>45</sup> were established, to improve access to agricultural and market information (Qiang, Rossotto and Kimura 2009:40).

Other ICT initiatives in Africa aimed at improving access to agricultural information and knowledge that responds to the needs of farmers include the Collecting and Exchange of Local Agricultural Content (CELAC) in Uganda, that targets female farmers and uses a variety of ICTs including cellular phones, short messaging service (SMS), chat rooms (Yahoo and Skype), websites, radio and resource centres to collect, repackage and disseminate local agricultural knowledge (Munyua 2007). According to Karamagi Akiiki (2008:16), the Busoga Rural Open Source and Development Initiative (BROSDI) which is implementing CELAC has developed a web-based platform using the second generation web (Web 2.0) tools to support knowledge sharing and marketing among small-scale producers. Web 2.0 is a new generation of tools that facilitate networking and collaboration to address the needs of individuals, communities and organisations. For example, the agriculture blog of BROSDI provides a stage for two-way communication, thus facilitating the sharing of agricultural information, local knowledge, ideas, challenges and dreams. Farmer's Friend, in Uganda provides weather updates and tips on farming via SMS. Farmer's Friend is an innovation of Google in collaboration with the Grameen Village Program. The WorldSpace radio is also being used to deliver agricultural information and knowledge to disadvantaged rural communities (Mchombu *et al.* 2001:185; Munyua 2007).

The convergence of traditional, conventional and modern ICTs offer multi-media capabilities that permit the packaging of information in formats that address the needs and circumstances of local populations (Chapman and Slaymaker 2002:9; Tichá and Moulis 2004:60-61), have a wide reach and facilitate knowledge management and information dissemination activities (Garforth, Khatiwada and Campbell 2003). Wilson (2006a:682), noted the "information age" and the world wide web have brought information issues to the attention of governments, agencies funding research, and the media among others, and to the rural communities. Players in the public and private sectors have harnessed the benefits of ICTs to improve livelihoods and have applied various ICTs including the radio, video, TV, cellular phones and internet to capture, share and disseminate agricultural innovation, knowledge and information (Van Crowder *et al.* 1998; Munyua and Adupa 2002; Iibuodo 2003; Bertolini's 2004; Ferris 2004; FOODNET 2007; Guislain *et al.* 2006:6; Heeks 2007; Karamagi Akiiki 2006; Mukhebi *et al.* 2007; Tradenet.biz 2007; The World Bank 2007c:175; Munyua, Adera and Jensen 2009; Muto and Takashi 2009; Samah *et al.* 2009:95). The convergence of ICTs has ensured wider access to knowledge and information in rural areas (Attias and Deflander 2003; Kwake 2006; Wild 2006:1) to address the challenges of the digital divide between the urban and rural areas (Mehra,

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<sup>45</sup> e-Choupals are public access centres that provides access to the internet and offers agricultural and market information to farmers in rural areas in India.

Merkel and Bishop 2004:782); to improve communication (Del Castillo and Braun 2006:48) and to capture and store knowledge and information (Wild 2006:1). A number of organisations have set up initiatives, networks and systems using modern ICTs to improve linkages and flows among small-scale farmers. A few initiatives are discussed briefly below. Unlike the old rural radio, modern FM radios are converged and interactive and provide an avenue for farmers to phone in and ask questions or make comments (Mukhebi 2004; 2006; Karamagi Akiiki 2006:71). FM radios have been widely adopted in Africa, and have been rated as the most effective channel for disseminating agricultural information (Chapman *et al.* 2003:2; Guislain *et al.* 2006:6; Kwake 2006).

Converged ICTs have also been used for enhancing markets and making them more accessible, improving the quality of public service provision, allowing more effective utilisation of existing social networks and creating new institutional arrangements to strengthen the rights and powers of poor communities (Torero and von Braun 2006:4-5). Several initiatives have been launched in Africa to improve markets, provide market information and enhance agricultural productivity including the Tradenet.biz, the Market Information System and Trader Organisations in West Africa (MISTOWA) (Munyua 2007); the FoodNet initiative in Eastern Africa (Ferris 2004; Foodnet 2007); and KACE which operate on a platform that offers services and market information to farmers in the region via conventional and modern ICTs including the internet, e-mail, telephone and FM radio (Mukhebi *et al.* 2007). As noted by Mangstl (2008:5), the cellular phone has demonstrated its power to communicate agricultural information to marginalised people.

Focusing on the Kenyan context, an external review of the IDRC Acacia program revealed that ICTs have been successfully used by Drumnet (an NGO) to access agricultural and market and marketing information (Bachelor, Hafkin and Chéneau-Loquay 2005). KACE, has established rural based market centres and market information points that are using a mix of ICTs including radio, mobile phone, SMS service branded “SMS Sokoni,” interactive voice response and the internet to provide market information to farmers and traders (Mukhebi 2004; Mukhebi *et al.* 2007). KACE is also implementing a special radio programme - “Soko hewani”<sup>46</sup>, in Western province, through a local FM station to provide a platform for virtual trading for small-scale producers. The two-way communication strengthened business relations between the buyer and the seller. Individual farmers or groups of farmers can offer their produce for sale or make bids to buy goods by interactively contacting the radio station by SMS, phoning in, fax or through offline transactions (Mukhebi *et al.* 2007).

The NALEP programme of the Ministry of Agriculture and the Ministry of Livestock Development in Kenya launched NAFIS – a voice-based and web-based system that integrates modern and

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<sup>46</sup> “Soko Hewani” is a Kiswahili word meaning supermarket on air (Mukhebi *et al.* 2007).

traditional ICTS (web information service and telephone), that allows farmers to access extension information by phone or via the internet in English and Kiswahili (RoK. NALEP 2008:34-35) (see **section 2.2.4.3**). In their study on ICT resource centres in rural areas, Ochieng and Waema (2009) used collaborative adaptive methods in designing a cellular phone knowledge management system interface linked to the web, which was used to access relevant agricultural information, markets and prices in English and Kiswahili, and the participatory approach helped to address the challenge of technophobia and lack of ICT skills.

ICTs are, however, not a panacea and a review of the literature suggests that there are many challenges associated with use of modern ICTs (Zijp 1994; Stilwell 2000:188; Heeks 2002; Chapman and Slaymaker 2002:3; Catts and Lau 2008:35) (see **section 4.7.5**). Stilwell (2000:188-189) highlighted the need to ground and develop ICT initiatives in the context of rural information provision while at the same time aiming at achieving synergy with local knowledge. Scholars have also observed that there is inadequate local content to meet the needs of rural communities (Munyua and Adupa 2002; Colle and Roman 2003:30; Heeks 2007). In addition, rural communities have low literacy levels, which affects the use of ICTs (Morris and Stilwell 2003; Munyua 2003; Mook, Munyua and Nampala 2005; May, Karugia and Ndokweni 2007). The issue of high costs for accessing ICTs has also been emphasised (Bagnall-Oakeley and Ocilaje 2002; Asingwire 2003; Morris and Stilwell 2003; Munyua *et al.* 2003; Maru 2004; Mook, Munyua and Nampala 2005; 2007; Karamagi Akiiki 2006:71; Jensen 2006; Kwake 2006; Matambalya and Wolf 2006:184,197; Heeks 2007). A major challenge to the use of ICTs in rural areas is limited access and connectivity (low bandwidth, and poor connectivity due to poor infrastructure, low teledensities) (Jensen 2006:3; Kapange 2006:157; Richardson 2006; Mangstl 2008:5), and power outages (Kapange 2006:157). The few public access points in rural areas (telecentres, access points, knowledge centres) were largely donor funded and ceased to operate efficiently after project completion (Benjamin 1999; Holmes *et al.* 1999; Heeks 2002; Mayanja 2002; Munyua 2003; Kalusopa 2005; Asaba *et al.* 2006). Kalusopa (2005) observed that most of these initiatives were projects, hence had a start and finish date, which made continuity of activities a challenge. According to Harris (2004), evidence supporting the use of ICTs in these initiatives remained anecdotal, and the initiatives were scattered and uncoordinated. Besides, most ICT public access initiatives were not sustainable (Munyua 2003).

Studies conducted by various authors have revealed low usage of modern ICTs among small-scale farmers (Kalusopa 2005:419; Mosia and Ngulube 2005; Kwake 2006; Chisenga, Entsua-Mensah and Sam 2007:11; Fourie 2007:79; Kinengyere 2007:339-340; Kante *et al.* 2009:284; Okello, Okello and Ofwona-Adera 2010:15) (see **section 4.7.5**). The factors contributing to low usage include lack of awareness of the potential of ICTs in influencing agricultural practices, (Munyua and Adupa 2002; Munyua 2003; Bertolini 2004), inadequate ICT skills (Maru 2004; Richardson 2006; Fourie 2007:32),

inappropriate ICT policies, especially those that address rural communities and rural development (Jensen 1997:13; Guislain *et al.* 2006: 14; Kapange 2006:157; Heeks 2007; May, Karugia and Ndokweni 2007). Juma and Yee-Cheong (2005:54) and Fourie (2007:30) raised the issue of inappropriate technologies and argued that the ICTs used should be appropriate for the needs of rural people and match their skills, while Okello, Okello and Ofwona-Adera (2010:15) pointed out the high cost of cellular phone airtime. In addition, various authors (Curry, Kooijman and Recke 1998:6; Mutua-Kombo 2001; Ramírez and Quarry 2004:12; Karamagi Akiiki 2006:76) have suggested that ICTs need to be rooted in the cultural background of the different communities in order to improve their uptake. As pointed out by Longbottom (2009), computers were not part of everyday life of the rural people in developing countries and may not be the appropriate tool for rural farmers, whereas the cellular phone device appeared more practical and effective.

Because ICTs hold many opportunities for improving linkages and the flow of knowledge and information (Bachelor, Hafkin and Chéneau-Loquay 2005; Okwu, Kuku and Abaz 2007:017; Ha, Okigbo and Igboaka 2008:402; Wirastuti *et al.* 2008:136; Idiegbeyan-Ose and Akpoghome 2009:027; Munyua, Adera and Jensen 2009:7), the present study included a component on ICTs in its investigation of the AKIS of the small-scale farmers.

#### **4.7.4 Usage of agricultural information and knowledge**

As explained in the definition of key terms in the preliminary pages, “Information use” depends on the context. Abbott (1989:38) considered the notion of utility to be a subjective judgment of the ability of the information to satisfy a specific need at a given point in time. In other words, the use of information that resulted in value was perceived to have inherent merit. Buchanan-Smith, Davis and Petty (1994:69) observed that some of the existing information systems were not being used adequately. Woytek (1998:6-8) noted that there was underutilisation of indigenous knowledge systems. According to Buchanan-Smith, Davis and Petty (1994:69), issues such as who has access to the information, who controls it, who owns it, credibility of the information and existing relationships determined who had access to the information. It has also been pointed out that usage of information was low where users were not aware of the resources available (Buchanan-Smith, Davis and Petty 1994:69; Munyua 2003; Kinengyere 2007:339), where the content provided was irrelevant to users’ needs (Bokhari (2005), and where users did not know how to utilise the available resources (Kinengyere 2007:339-340). As pointed out by Bokhari (2005), a successful information system is that which meets the needs of users. According to Bokhari (2005), the success factors of an information system include usage and user satisfaction, capability or performance of the system in terms of effectiveness, and quality of information. An information system helps to improve decision making and overall efficiency and effectiveness of individuals and organisations within an AKIS.

Information supports innovation (Maruthi and Srinivas 2006:3), food production, trade and natural resource management (The World Bank 2010a:134), but the study of AKIS by Rees *et al.* (1999:549) in Kenya observed that there was little information being shared between farmers with government offices and NGOs. Munyua and Adupa (2002) arrived at similar findings in Uganda, which showed that the majority of farmers were not using the agricultural materials and services available at the telecentres. Garforth *et al.* (2003:4) found that the cost of information contributed to the low usage of information and pointed out that although information is considered a public good accessible to all people, it may also be a merit good which only a few recognised as valuable and purchased in the desired amounts. Weiss, Van Crowder and Bernardi (2000:185) and Zhao, Zhang and Klein (2009) established that farmers were willing to pay for information where the expected returns appeared favourable, or where they perceived the information to be useful. However, some farmers were reluctant to pay for information services (Hooton *et al.* 2006:546), and preferred free services (Van den Ban 1998:66).

Studies by Munyua and Adupa (2002) and Chipeta (2004:6) revealed that information alone was not of much value to farmers, as it was also necessary to provide the means to use the information, such as inputs, skills and advisory services. In other words, farmers' needs were diverse and needed to be addressed in an holistic manner by providing linkages to other actors such as credit, input suppliers and extension services. Stefano *et al.* (2005) showed that awareness of existing AKIS influenced use of information resources. They noted that better generation and use of information did not automatically result in greater utilisation of the knowledge gained. In this regard, Olsson (2005c) recommended investigating information use in order to understand individual and corporate information behaviours. The present study assessed the usage of different types of information and knowledge by small-scale farmers in Kirinyaga district, Kenya and how it facilitated decision making, problem solving, innovation and understanding.

#### **4.7.4.1 Types of information used by small-scale farmers**

Farmers used different types of information to meet their diverse needs. Salomon and Engel (1997b) advanced six types of information based on value and importance to farmers namely i) strategic, ii) operational, iii) policy, iv) technical information, v) market information, and vi) awareness information. Another type of information used by farmers was tactical information (Van den Ban 1998). In addition to the six categories above, Salomon and Engel (1997b) classified information that farmers used into four categories based on how the information was applied, namely for i) image or opinion formation, ii) determination of needs, iii) comparison of alternatives and for iv) implementation of solutions. The type of information used depended on the type of decision that needed to be made or problem that needed to be addressed (Fountas *et al.* 2006:197), and varied from country to country and from location to location. For example, Rees *et al.* (2000:10) found that

farmers in four different districts in Kenya mainly used operational information, followed by awareness, technical then marketing information. However, Zhao, Zhang and Klein (2009) in Mongolia found that dairy farmers mainly used policy and marketing information, followed by technical and other types of information.

The literature suggests that knowledge and information are underutilised by farmers (Aina, Kaniki and Ojiambo 1995; Harris 2004; Kinengyere 2007:339-340). For example, Ferris, Engoru and Kangazi (2008:8) found that although market information was important, usage of this type of information was low. On frequency of use of information, Kinengyere (2007:339-340) found low frequencies of obtaining information, while Zhao, Zhang and Klein (2009) established that only a few farmers used information often, and a significant 41% did not use information or did not know the frequency of access. Despite the low usage, each type of information used had its own economic value (Llewellyn 2007:149).

#### **4.7.4.2 Use of agricultural information and knowledge for improving understanding, problem solving and decision making**

Many authors have emphasised the importance of information and knowledge in improving people's understanding of farming concepts and methods (Kaniki 1989:6; IIRR 1996:3; Röling and Jiggins 1998), and as pointed out by March (1994:24), limitations on information act as barriers to the decision makers. Kaniki's (1989:6) point was supported by the thinking of Debons, who argued that decision processes required information as well as knowledge, and by Tichá and Moulis (2004:59) who stressed that appropriate decision making required timely and accurate knowledge and information. Knowledge was important because it enabled people to make improved decisions (Davenport and Prusak 2000:170), while information made decision making easier (Awad and Ghaziri 2004:36). Opondo *et al.* (2006) pointed out that farmers often make decisions, assess their performance, monitor and improve their activities, address power relations and improve problem solving. As explained by Backus, Eidman and Dijkhuizen (1997:307), farming is a risky venture with many uncertainties, but profitable. Farmers thus need to constantly make decisions based on changes in their practices and farming systems (Van den Ban 1998:58). Decision making under risk pertains to decisions made where the outcomes or consequences of the decisions are uncertain "but the probabilities are known" and the value increased with the riskiness (March 1994:6-7).

Del Castillo and Braun (2006:7) and Kahan (2008:8,34) reiterated that subsistence farmers face serious risks in their farming activities because their livelihoods are dependent on how much they produced. Farmers thus needed information and skills on alternative options, assurance and markets in order to make decisions that mitigate risks. Farmers also use information to solve problems (Warren 1991), and as aptly expressed by Abid (1995:11) and Meyer (2005), information is the

precursor to problem solving. The knowledge required in solving problems depended on personal interpretation, based on an individual's ideas, perceptions and experiences, and their skills and ability and not so much a model solution (Scoones and Thompson 1994:18; Little *et al.* 2000:84; Williamson *et al.* 2003:191,193). As pointed out by Zand (1972:231-237), trust is an essential ingredient that improved the effectiveness of problem solving while mistrust led to misunderstandings. According to Zervekh and Claborn (2006), problem solving<sup>47</sup> and decision making<sup>48</sup> were similar but problem solving focused on defining a problem, identifying alternative solutions, selecting a solution(s) to implement and evaluating the outcome. To Sweeney and Martin (2008:3), problem solving was “the process of identifying a difference between the actual and the desired state of affairs and then taking action to resolve the difference.”

Decision making is viewed as a narrower activity than problem solving (March 1994:14). The decisions made by farmers are shaped by the social and economic characteristics of the farmers such as labour availability, wealth position and membership in the community. According to Rausch (2001) and Failing, Gregory and Harstone (2007:56), the main processes involved in decision making included i) identification of the issue, ii) generating alternative possibilities and seeking additional guidance on resources and expertise required as well as benefits and consequences of each strategy, iii) choosing the best strategy based on expected benefits, available resources and constraints and iv) developing an action plan. According to Williamson *et al.* (2003:193-194), FFS farmers producing vegetables in Kenya base their decision making process on agroecosystem analysis<sup>49</sup>. Wiig (2004:66) observed that people tended to make decisions by repeating past experiences and doing what appeared natural to them. Building on this point, Eckert and Bell (2005) explained that the decisions and actions of individual farmers were unique and each decision was based on the distinct workable mental models of farming, which were influenced by the unique knowledge assets they possessed, experiences, skills, values, beliefs and ways of processing information.

As discussed in **section 4.4**, knowledge is the basis for all conscious action, and exists in the minds of people. It is based on life's learning experiences over time, and is structured by tradition, education and daily interactions with the environment (Oettie and Koelle 2003:10, 14). Kaniki (1989:6) pointed out that all stakeholders, including farmers were decision makers, and information was crucial if meaningful solutions were to be found. As noted by Rausch (1996:35), involving other people to

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<sup>47</sup> Problem solving was defined as the process of “identifying issues worthy of attention, setting goals and designing suitable courses of action” (Simon 1992:32 cited in Case 2002:83), or defining a problem, identifying alternative solutions, selecting a solution(s) to implement and evaluating the outcome (Zervekh and Claborn 2006).

<sup>48</sup> Decision making is defined as the “activity of evaluating and choosing among alternative actions to take in response to a problem” (March 1994:14).

<sup>49</sup> Agroecosystem analysis is the approach used in the FFS curriculum that entails regular analysis of plant health, ecology and problems, analysis of problems and needs, discussions on potential interventions and decision on management practice (Williamson *et al.* 2003:188).



participate in decision making improved the quality of decisions made because the decisions made drew from the specialised expertise and views of different people. Decisions made by small-scale farmers were dependent on: i) the external information they used (Kaniki 1989:84; Ndiaye 1995:119), ii) the prevailing environment, opportunities and constraints they faced, iii) the expertise or knowledge of the user, which would be required as “background” data against which to evaluate the alternatives (Shibanda 1999), and iv) the contexts of their local knowledge (Duveskog, Mburu and Critchley 2002). Nyumba (2006) emphasised the role of local knowledge and emphasised that it was a major input in determining choices made by farmers, and in managing natural resources (The World Bank 2010a:18). In addition prior understanding or mental reference models possessed by the users of information was considered a factor in decision making (Wiig 2003).

Leathers and Smale (1991) pointed out that most farmers do not often adopt the whole package of a new technology being promoted but rather, they adopt pieces of it sequentially and over time. Leathers and Smale (1991) also observed that adoption patterns varied among farmers and within agroecological zones and pointed out that the reasons behind this adoption pattern is not fully understood. Kaniki (2001) explained that experience based on acquired knowledge from accumulated information with a specific purpose affected decision making processes. This background knowledge made some issues look normal to some individuals or groups or community but not to all. For Wiig (2004:66) people tend to make decisions by repeating past experiences and doing what appeared natural to them. For example, a case study conducted in Kenya suggested that involving farmers in all stages of technology development helped them to understand, made technology development more relevant, provided farmers with a basket of technology options to choose from and enhanced adoption (Mulaa *et al.* 1999:25). Decision making was thus value based and concentrated on a set objective, identifying and evaluating alternative decisions, selecting a decision to implement and evaluating the outcome (Zervekh and Claborn 2006). Davenport and Prusak (2000:170) stress that knowledge is valuable because of its ability to enable people to make improved decisions and take the necessary action. They argued that knowledge was managed because it improved decision making. For Kahan (2008:5,55) one of the main areas that farmers focused on in making decisions was risk reduction.

Shibanda (1999) pointed out that small-scale farmers are goal-centred, and rational when weighing options regarding their livelihoods or agricultural activities such as adoption of new ideas, hence were managers in their own right. Shibanda (1999) observed that farmers took time before arriving at a decision, and the decision taken was based on expected outcomes and constraints. As pointed out by French (1995), most resource allocation decisions were made at the farm household level, and decision making did not take place in a linear manner, but rather farmers considered many factors. For example, in choosing an enterprise, farmers considered whether it would be a perennial or annual

crop, or livestock or fish as well as post-harvesting aspects. In making labour decisions, farmers weighed up using family or hired labour, off-farm employment. According to Solano *et al.* (2001:188,190), individual decision making was the most frequent decision making approach, and often the decision was carried out by a household head who was often the male farmer, or collectively as a family. The decision made was often influenced by the needs of the household, their values, beliefs and experiences (French 1995; Eckert and Bell 2005; 2006).

In the context of group decisions, Rauch (1996) emphasised the need for appropriate participation and for simple guidelines such as whom to involve, at what level to involve them, when to involve them and at what intensity. For March (1994:167), participation impacted on satisfaction with the outcome. A study by Davis (2004:156) in Kenya showed that all group members participated in group decision making. This level of participation helped members to clarify issues and “meet everyone’s expectations and the needs of all” (Rausch 2001:1). However, Barkhi *et al.* (1998:206), found that group decision making processes encountered complex issues because some individual members pursued personal objectives. Nevertheless, whether group or individual decision making, Davenport and Ghaziri (2000:170) cautioned that linking specific knowledge and information to specific decision outcomes was not simple.

#### **4.7.4.3 Use of agricultural information and knowledge for innovation**

The concept innovation was briefly outlined in the definition of key terms in the preliminary pages, and discussed at length in **section 4.1.7**. Röling and Wagemakers (1998:3-4) posited that information from the past played a key role in shaping individual and collective choices, and innovation was the main mechanism for survival. For Röling and Wagemakers (1998), adaptation depends on timely development of knowledge, technology, organisation, creativity, inventiveness and innovation. Nieuwenhuis (2004) explained that the process of innovation was complex and was based on learning and trial and error. Innovation is thus a key driving force for working collaboratively or as a group (Engel 1997; Onduru *et al.* 2002). People are constantly innovating through experimentation and discovery, and rural communities innovate by “evaluating, adopting, and adapting new technologies” through social processes of interaction or networking (Engel 1997).

Adenso-Okyere, Davis and Aredo (2008:1) and The World Bank (2009a:258) pointed out that there were many different sources of agricultural innovation and actors down the value chain including researchers, farmers, CSOs and the private sector. The interactions (between members and actors) led to the sharing of information and knowledge, and mutual learning among multiple actors (Röling 1995; Engel 1997:14; Röling and Jiggins 1998:304; Berdegue 2005:3-4; KIT 2007). In addition, Choo (1998) argued that innovations “germinate from the seeds of tacit knowledge” and new value was generated when the inexplicit knowledge was made explicit. Innovation was thus seen as a product

of networks that interact and yield new solutions to addressing social or economic dynamics (Salomon and Engel 1997a; Berdegue 2005:3-4; Kamau 2007:154,155). There were many examples of farmer innovations that were applied by small-scale farmers. Kamau's (2007:154,155) study in Mwea division in Kirinyaga district, Kenya showed that farmers' groups were innovative and obtained information on rice ratoons and low yielding rice plants, which they used as fodder to feed their milking cows to increase milk production. Other innovations of farmers included using cow urine for treating animal diseases and controlling field pests (Dinucci and Fre (2003:22-23; Mihale *et al.* 2009:254).

Various actors (Choo 1998; Kibwana 2001:50) note that agricultural development is underpinned by continual innovation and experimentation. Röling and Pretty (1997) stressed that it is necessary to understand and support agricultural innovation and experimentation. Röling and Pretty (1997) demonstrated that participatory approaches enabled different actors such as researchers and extensionists to contribute to agricultural innovation. Farmers played an important role in innovation and have enormous local knowledge and capacity for innovation (Duveskog, Mburu and Critchley 2002). For example, Garforth's (2001b) study of AKIS in Eritrea, showed that farmers contributed to agricultural development, and revealed that the most successful agricultural innovations came from farmers. Farmers have been experimenting on their own for self-learning, and are disseminators of agricultural innovation (Reij and Waters-Bater 2001a:5; Pretty and Wesseler 2004:8; Waters-Bater and Van Veldhuizen 2005:2; Nwokeabia 2006:1; Hoffmann, Probst and Christinck 2007:356-359).

Farmers need to learn about improved farming techniques, market needs, and science and innovation provide solutions based on scientific and local knowledge and information (Galindo 2007:89). According to Reij and Waters-Bayer (2001a:5), innovations by farmers demonstrate how local resources can be used to exploit opportunities and solve problems. For example, a study by Matovelo, Msuya and De Smet (2006) demonstrated that farmers used external information for innovation, and that most farmers desired to have information on different agricultural innovations in order to improve their farming practices. Braun *et al.* (2007:19) revealed similar findings, and showed that farmers in Kenya had used external information and benefitted from collective marketing of their dried "value-added orange-fleshed sweet potatoes," which fetched higher prices than for the fresh produce. However, there were many barriers and constraints in accessing agricultural information, knowledge and innovation.

#### **4.7.5 Barriers to accessing agricultural knowledge and information**

Despite the extensive information sources, and the available services, a review of the literature suggests that there are many barriers to accessing agricultural information (Kaniki 1989; Buchanan-

Smith, Davis and Petty 1994:69; Aina 1995:10; Stefano 2004; Menou and Mchombu 2007). As Kizilaslan (2006:504) pointed out, there are still many unresolved problems in the flow of agricultural information, and vital parts of agricultural information systems have not performed as expected. Consequently, information has not reached the target users in an efficient and timely manner. The main barriers to accessing agricultural information are outlined next:

#### **4.7.5.1 Insufficient or lack of agricultural knowledge and information**

Scholars have observed that there was inadequate agricultural information for small-scale farmers (Tripp and Pal 2000:139,142; Mchombu *et al.* 2001:185; Onderstesteijan, Giesen and Huirne 2003:37,50; Mubangizi, Mangheni and Garforth 2004:261; Stefano 2004; Stefano *et al.* 2005b; Matovelo, Msuya and de Smet 2006:260-261; Menou and Mchombu 2007; Chilimo 2008:260), while others noted that farmers lacked sources of agricultural knowledge and information (Rivera, Qamar and Mwandemere 2005:30). For example, various authors (The World Bank 1998; Renko, Nikolasevic and Pavicic 2002:544; Collinson *et al.* 2003:27; Bagnall-Oakeley *et al.* 2004; Kidane, Maetz and Dardel 2006:xiv,55; Braun *et al.* 2007:19; Mukhebi *et al.* 2007:23; Pokhrel and Thapa 2007:157) have highlighted the untimely, limited and in some cases lack of information on markets, prices and marketing in rural areas. Meyer (2000:141,147) pointed to gaps in information on proper farming practices. Other authors (Failing, Gregory and Harstone 2007:48) pointed out that there was no information on how to integrate external and local knowledge. This inadequacy may have been contributed to by the failure in capturing and publishing of local content (Modi 2003:683; Mchombu 2007:39).

#### **4.7.5.2 Poor quality and accuracy of information**

In some instances, the political value of information outbalanced its accuracy, timeliness, relevance and relationships between providers of information and users as well as the type of media used (Buchanan-Smith, Davis and Petty 1994:69). The study by Garforth (2001b) revealed that in some cases, the farmer-to-farmer exchange of information was not always accurate. Likewise, Cook (2009:6,8) identified the barrier of lack of accurate information.

#### **4.7.5.3 Inappropriate packaging of information**

Scholars acknowledge that little attention has been paid to repackaging content for farmers and that available content is inappropriately packaged (Mchombu 1992:29; Abid 1995; Mundy and Compton 1995; IIRR 1996; Allen *et al.* 2001:217; Stilwell 2001b; Munyua and Adupa 2002; Stefano 2004). Some authors (Onduru *et al.* 2002; Ofuoku, Emah and Itedjere 2008:561) have pointed out that most research results are available in technical language that rural farmers cannot comprehend and therefore needs to be repackaged. According to Mchombu (1992:29), “relevant content must be supported by appropriate presentation if information products are to have the desired impact,” and

should be made available in local language (Mangstl 2008:5). The repackaging of information is especially important for illiterate farmers, who require repackaged and audiovisual information products (Giovanetti and Bellamy 1996). Meyer (2002) shared this view, and asserted that “information is not a ready-made resource,” hence needed to be tailored to suit the needs of the rural communities. Experience in Tanzania has shown that researchers and extensionists do not involve farmers in the process of information generation and dissemination (Mchombu *et al.* 2001:187). As emphasised by Fourie (2007:30), content needs to be “people-centred, demand driven, value adding and in the local language.

#### **4.7.5.4 Poor access to agricultural knowledge and information**

Kaniki (1989), Stefano (2004), Kapange (2006:157), Rege (2006:216), Nathan, Lund and Theilade (2007:3) and Njeru, Gitonga and Machira (2008) observed that some of the agricultural information developed for farmers was inaccessible to the very farmers it was intended for. For instance Aina (1995:10), noted that information services offered to farmers were poor. Garforth’s (2001b) study in Eritrea established similar findings, and showed that although formal sources of information were credible, they were inaccessible. He explained that farmers found it difficult to access the Ministry of Agriculture information resources. Further, Snyman (2002) noted that there was inadequate information infrastructure. There were many actors involved in the generation of information and in decision making, the transition from information provision to use was complex (Buchanan-Smith, Davis and Petty 1994:69). The multiple information providers created inappropriate, centralised and bureaucratic structures, which blocked the knowledge flows. There was also the lack of awareness of and the time to locate the existing external information resources (Abid 1995:13; Odini 1995; Munyua and Adupa 2002; Franzel *et al.* 2004; Stefano *et al.* 2005b:64; 2009:51) and local knowledge (Kimenye 1998:201,210; Chisenga 2002:17; Franzel *et al.* 2004; Stefano *et al.* 2005b:64; 2009:51; Mihale *et al.* 2009:255).

#### **4.7.5.5 Low usage of agricultural knowledge and information**

Despite the importance and value of knowledge (Scoones and Thompson 1993:2; Von Liebenstein 2000:2; Onduru *et al.* 2002) and information (Kinengyere 2007:339-340), they were underutilised, especially where users do not know how to use the available resources. Findings of a study conducted by Buchanan-Smith, Davis and Petty (1994:69) in Ethiopia, Sudan, Chad, Mali and Kenya revealed that usage of information was low. In addition, there are barriers like doubt, mistrust and jealousy (Temu, Mwanje and Mogotsi 2003:3-4). Meyer (2000:143; 2005) and Masakure and Henson (2005:1728) note that trust and honesty are essential in influencing acceptance of and sharing of information. On the other hand, Hofmann and Rischkowsky (2005:2,3) and Middleton (2007:2) observed that there is underutilisation of local knowledge. Leach (1999:81) and Ofuoku, Emah and

Itedjere (2008:559) note that rural communities were often too busy on the farm and did not have sufficient time to seek information.

#### **4.7.5.6 Illiteracy**

Illiteracy<sup>50</sup> is a key barrier to accessing agricultural knowledge and information (Odini 1995; Meyer 2000:207; 2005; Mchombu *et al.* 2001:185; Rosenberg 2001; Stilwell 2001b; Mamodu 2002:409; Mchombu and Cadbury 2006:6). Linked to this evidence is the observation that most rural communities come from oral culture systems that prefer orally communicated information and knowledge through local groups, relatives and personal experiences (Leach 2001a:54; Stefano 2004:53; Kalusopa 2005). This oral culture has also contributed to low uptake of print and electronic knowledge and information products (Kalusopa 2005).

#### **4.7.5.7 Information literacy**

Kinengyere (2007:339-340) believes information illiteracy<sup>51</sup> is a major contributor to low usage of agricultural information. UNESCO's Information for All Programme (2007:3) emphasises the concepts of access to information that is "living" and use of information. Indeed Catts and Lau (2008:7,35) identified adult literacy and ICT skills as prerequisites for ensuring an information literate knowledge society. Many authors (Odini 1995; Storer, Thunder and Murray-Prior 2001; Snyman 2002; Chaka 2003:65; Morris 2007:24) identified the barriers posed by inadequate skills. Emphasising this point, Kinengyere 2007:339-340 explained that the main reason for not using information systems was because people did not know how to use the resources available.

#### **4.7.5.8 Language**

Most of the available agricultural information was in English, yet research has shown that farmers preferred to access information in their local language (Odini 1995; Bagnall-Oakeley and Ocilaje 2002; Stefano *et al.* 2005b; Matovelo, Msuya and De Smet 2006:261; May, Karugia and Ndokweni 2007; Llewellyn 2007:155; Mchombu 2007:39).

#### **4.7.5.9 Non-sharing culture**

Many authors (Bagnall-Oakeley and Ocilaje 2002; Gordon 2002; Karamagi Akiiki 2006:74; Nwokeabia 2006:1-2; May, Karugia and Ndokweni 2007; Byamugisha *et al.* 2008:98) have pointed out that most of Africa suffer from a culture of not sharing knowledge and information, and that some community members are reluctant to share what they know. The non-sharing culture led to information asymmetries (Evgeniou and Cartwright 2005:297; Nwokeabia 2006:1-2); Ferris, Engoru

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<sup>50</sup> Illiteracy is described as the inability to read and write.

<sup>51</sup> Information literacy – the Alexandria Proclamation adopted the definition of information literacy as a means to "empower people in all walks of life to seek, evaluate, use and create information effectively to achieve their personal, social, occupational and educational goals" (Horton 2007:ii).

and Kangazi 2008:1), which some used to their advantage to gain a competitive edge over competitors in the market (Garforth *et al.* 2003:3). Bagnall-Oakeley and Ocilaje's (2002) study noted that farmers in Uganda withheld market and financial information in order to maintain a comparative advantage over their peers. Nwokeabia's (2006:1-2) study noted that farmers had fallen into an "indifference trap," suggesting that some farmers perceived that there was no point in sharing knowledge because there was very little or nothing to share or gain anyway. Some of the reasons cited for this apathy include the lack of recorded knowledge that could be shared, and the lack of awareness of what had been developed or who needs it.

#### **4.7.5.10 Low uptake of ICTs**

ICTs contribute to improved access to agricultural information. Nevertheless, there is low uptake of ICTs and there are many barriers to using ICTs in rural areas (Stilwell 2000:188-189; Heeks 2007; Catts and Lau 2008:35), as already discussed in **section 4.7.3.2**. In addition, Lallana and Uy (2003:32) suggested that the low usage of ICTs resulted from local information barriers, literacy barriers, language barriers and cultural diversity barriers, which impeded uptake of the internet and other modern ICTs.

#### **4.7.5.11 Inadequate ICT policies**

The study by Maina (2000:59) in Kenya pointed out that the lack of an information policy in Kenya had hindered effective information service provision in the agricultural sector. In addition, scholars have emphasised the need for developing ICT policies and strategies that address the needs of rural communities (Richardson 1996; Jensen 1997:13; Munyua 2003; Guislain *et al.* 2006:14; Kapange 2006:157; Heeks 2007; May, Karugia and Ndokweni 2007). Policy factors are the key obstacle to sharing agricultural information using electronic channels (Jensen 1997:13; Galloway and Mochrie 2005:42; Guislain *et al.* 2006; May, Karugia and Ndokweni 2007).

#### **4.7.5.12 Gender, power and cultural barriers**

Many authors (Curry, Kooijman and Recke 1998:95-98; Dissanayake 1992; Bachmann 2000:99; Mutua-Kombo 2001; Pitadata and Khan 2003:1-3; Gotschi, Njuki and Delve 2009:276; Kanté *et al.* 2009:288-290; The World Bank 2009a:15) note that gender and culture affect the way in which male and female farmers and farmers' groups access agricultural information and knowledge. Moock (1976:835) observed that attendance at barazas was dominated by male farmers and there was little participation by female farmers, while Kanté *et al.* (2009:288-290) found that more male than female farmers used available ICT public access facilities.

Dissanayake (1992) concluded that issues of culture and power needed to be incorporated in an AKIS to improve the flow of information and knowledge. Focusing on information providers and the

approach to dissemination, Mutua-Kombo (2001) considered the top-down manner in which information was transferred to be a constraint, and pointed out that most information providers were male, which posed a barrier to accessing information by rural women. Some actors did not share information they possessed with others for reasons of power and wanting to be ahead of others (Mubangizi, Mangheni and Garforth 2004:261). Barham and Chitemi (2009:57) argued that groups with male leaders were more likely to access market information and markets than groups with female leaders. In addition, some of the reasons given for not sharing information included building personal power (Bagnall-Oakeley and Ocilaje 2002; Gordon 2002), which led to power asymmetries (Kristjanson *et al.* 2009:5052).

#### **4.7.5.13 Other barriers and constraints**

Additional deterrents to accessing agricultural information and knowledge include the low appreciation of local agricultural knowledge (Scoones and Thompson 1993:2; Onduru *et al.* 2002; Von Liebenstein 2000:2); information was scattered in remote areas (Baker *et al.* 2001; Del Castello and Braun 2006:5); governments were not spending enough resources on knowledge production (Mchombu 2005:2) and the lack of platforms or mechanisms for sharing knowledge and information (Nwokeabia 2006:2). In addition, there were challenges of limited information providers in rural areas (Kiondo 1998:185; Rees *et al.* 2000:10; Ngowi *et al.* 2007:1622); messages emanating from different actors being conflicting and poor ICT infrastructure (Del Castello and Braun 2006:5) (see **section 4.7.3.2**). Irivwieri (2007:41) pointed out that some farmers were risk averse, and were reluctant to try out new technologies or innovations, while Van Den Berg and Jiggins (2007:663,676) observed that there was not sufficient systematic effort being devoted to providing learning opportunities to farmers. Finally, Kristjanson *et al.* (2009:5048) identified the barrier of social exclusion of farmers in policy debates, hence the needs and concerns of small-scale farmers were often not articulated in agriculture and information and knowledge related policies. The present study investigated the key barriers to accessing agricultural knowledge and information in Kirinyaga district.

#### **4.7.6 Existing knowledge management and information management practices**

Farmers are knowledgeable and resourceful (Mchombu 1991:173; Rajasekaran, Martin and Warren 1993; Kibwana 2001:50; Meyer 2003b; Modi 2003:683), and the knowledge they possess needs to be merged with external information and be adapted to the farmers' own environments (Rajasekaran, Martin and Warren 1993; Mundy and Compton 1995:122). There are many benefits in integrating external information and local knowledge (see **section 4.4.3**) but accessing information and knowledge, calls for managing the available resources. The concepts information management and knowledge management were explained in the definition of key terms and discussed in detail in **section 4.1**. Agricultural information management is more geared to managing explicit knowledge



and information (Bouthillier and Shearer 2002), and relates to activities, resources and tools required for acquiring, updating, storing and disseminating agricultural information of different formats to different user categories (Nathaniels *et al.* 2008:1). Different actors in agricultural development “manage, generate, transform, transmit, store, retrieve, integrate, diffuse and use knowledge and information” within a given area of activity (Salomon and Engel 1997a:19). Scholars have also pointed out the need for an integrated system that systematically collects, organises and repackages information for small-scale farmers (Mundy and Compton 1995; The World Bank 1998; Kalusopa 2005; Stefano *et al.* 2005b).

On the other hand, knowledge management “enables the creation, distribution and exploitation of knowledge” to create value (Tiwana 2002:4), and is a “systematic method for managing individual, group and organizational knowledge using the appropriate means and technology” (Abdullah *et al.* 2006). According to Abdullah *et al.* (2006), knowledge management entails “managing people, what they know, their social interactions in performing tasks, their decision making, the way information flows and the enterprise's work culture.” It opens up available knowledge, and facilitates the capturing, monitoring, promoting and leveraging of intellectual capital (Abdullah *et al.* 2006). As stressed by Dr Idle Omar Farah in his foreword to “*The indigenous knowledge of the Ameru of Kenya*,” managing local knowledge in the wake of the rapid cultural changes, was important and “there is an urgent need for indigenous knowledge of every ... indigenous / ethnic community to be documented” because of the rapid cultural changes (Farah 2008).

Whyte (2004:4) viewed the harnessing and management of local knowledge and external information as one approach to bridging the knowledge and information gap between the rich and the poor. Whyte (2004) argued that there was a need to strengthen the knowledge economies of most African countries, and suggested a shift towards interactive training and organisation management. The World Bank (1998) suggested the need for acquiring, absorbing, and communicating agricultural information and knowledge. Stefano *et al.* (2005b) also reiterated the need for a permanent record of knowledge and information to increase adoption of new improved technologies. In recognition of the importance of managing knowledge and information, international development and donor organisations and national and local organisations have increased their activity in AKIS (FAO and The World Bank 2000). In addition, Whyte (2004:4) noted that agricultural knowledge and information for small-scale farmers could be captured and documented through research and development, and through building local capacity to communicate knowledge using appropriate ICTs (see **section 4.7.3.2**). However, Modi (2003) observed that most local agricultural knowledge has not been documented. Despite the barriers discussed above and in **section 4.7.5**, some efforts have been made in managing agricultural information and knowledge and the following section addresses some agricultural information management and knowledge management practices.

#### 4.7.6.1 Information management practices

As discussed in **section 4.7.5**, one of the major barriers in providing access to agricultural information to farmers is that most information is not packaged and disseminated. Zijp (1994) argued that appropriate packaging and communicating of agricultural information was essential to accelerating food production. Further, Scarr *et al.* (1999:573) pointed out that the development of suitable information packages for learning and training of farmers was a key activity in ensuring agricultural technologies developed were adopted by farmers. Meyer (2000:209) concurred with this point and asserted that it was necessary to add value to information provided to small-scale farmers, and to provide it to them in a format and language that they can understand, use and access. This assertion suggests the need to collect, process, store and disseminate agricultural information to farmers. Furthermore, external information that had been managed has improved access and saved the users' time and resources. Rural communities could learn from external information, and adapt it to suit their local situations (Mchombu 2004:40). For example, Stefano *et al.* (2005b:61) found that farmers in South Africa used and shared print materials with neighbours and friends.

Stilwell (2001b:55) noted a number of ways in which information was being repackaged such as by the popular TV edutainment *Soul city* in South Africa, and this approach could be used to capture agricultural knowledge and information. Morris and Stilwell (2003) argued that since users were the best determinants of whether or not an information product met their needs, they should be involved in the development of information products. In support of this argument, a project in Uganda that showed great success in collective (researchers, extensionists, farmers, telecentre staff and content management experts) repackaging of agricultural information in form of videos, radio programmes, manuals, leaflets, posters and leaflets and a web site for small-scale farmers. The materials were made available in English and Luganda (Munyua and Adupa 2002; Asingwire 2003:32; IDRC 2004). Muyinza and Agona (2006:236) also took into consideration Mchombu's (2004:30) advice on involving farmers in determining which content to develop. They repackaged local content in a participatory manner and involved farmers' group representatives, non-group members, researchers and experts. The materials developed were translated into the local language. Gianatti and Carmody's (2007:171) study in Australia demonstrated that the collective packaging (growers' groups, researchers, the private sector) of information in a workshop set-up allowed the delivery and sharing of new knowledge and skills to groups of farmers.

The case study of the Evergreen Farming group (EGF) in Australia revealed that farmers had successfully used the internet to support farmers' field days via a group website (Easdown and Starasts 2004). Farmers in the EGF obtained personalised internet training, digital cameras, web publishing and instruction on how to access information on the web site. These online communities

ensured there was congruence between the current information on the internet and how farmers learned, shared and exchanged contextualised information that was relevant to their needs. In Uganda, the CELAC project was using “Google maps” to share agricultural information and market information (Karamagi 2008:16). As reiterated by Mehra, Merkel and Bishop (2004:799), “in order for the internet to play a greater role as an instrument for social and personal empowerment, we need to understand what the everyday life of an individual belonging to a minority or marginalized community encompasses.” On the other hand, Dutta (2009:49) suggested the use of public libraries for disseminating information, while Stilwell and Munyua (2009) suggested a number of innovative resource centres and library models that were in use in rural Africa that could be adapted to suit the needs of farmers.

In Kenya, Ojiambo (1989 cited in Kiplang’at 1999:115) observed that there was poor access to agricultural information by rural communities, and Maina (2000) and Rege (2006:216a) highlighted the lack of a systematic approach for collecting, analysing, storing and disseminating agricultural information. As noted by Kiplang’at (1999:115), rural people get bypassed by “acquisition, processing, storage and communication” of agricultural information. In response to this need, farmers in Kenya have obtained agricultural information through farm visits, farmer seminars or courses, field training, demonstrations and education tours (Chepsaigutt 1997:248), farmer-to-farmer visits and evaluation (Mulaa *et al.* 1999:26); farmer field days (Njuguna, Oduor and Njenga 1999:69) and through national and regional agricultural shows (RoK. Ministry of Agriculture 2006:8-9).

There have been various efforts at managing agricultural information for rural communities. For example, the Ministry of Agriculture and Livestock Development has established the Agricultural Information Resource Centre (AIRC), to collect, process, store, and disseminate agricultural information to extensionists and farmers. Content for farmers has been packaged as radio programmes, videos, manuals and booklets in English, Kiswahili and local languages (Maina 2000; Mook, Munyua and Nampala 2005; Munyua 2006; RoK. Ministry of Agriculture 2006:8-9; RoK. Ministry of Agriculture and Ministry of Livestock and Fisheries Development 2007). More recently, the Ministry of Agriculture and the Ministry of Livestock Development have managed agricultural information for farmers by developing the NAFIS (Republic of Kenya. NALEP 2008:34-35; Gakuru, Winters and Stepman 2009) (see also **section 2.2.4.3**).

In addition, there are several NGO initiatives in managing agricultural information for small-scale farmers including those of AfriAfya and ALIN-EA, which are using print, radio, video, CD-ROM, TV and internet. These NGOs have also established public access points, knowledge (maarifa<sup>52</sup>) centres and digital villages that provide agricultural information to rural communities (see **section**

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<sup>52</sup> Maarifa is a Kiswahili word for knowledge.

**4.5.6 and 4.7.2).** Another example is the Kenya Network for Dissemination of Agricultural Technologies (KENDAT), which works with groups of farmers to repackage content in the form of radio programmes, books, manuals, pamphlets and newsletters in English and local languages. Radio programmes are broadcast through local radio stations, FM stations and WorldSpace radio. KENDAT has established 16 techno centres that supply inputs and information to farmers, and organises exhibitions, demonstrations and exchange programmes to facilitate the sharing of agricultural information and knowledge. Farmers have organised themselves into listenership groups, where they listen together and discuss the content (Munyua 2007). As pointed out by Galindo (2007:87), most studies on knowledge management have focused on areas with good ICT infrastructure and very few have dwelt on rural areas.

However, as discussed in **section 4.7.1.2**, some farmers did not share information they possessed with other community members, which led to barriers in information management, and information asymmetries (Evgeniou and Cartwright 2005:297). In addition, there were insufficient human resources with the appropriate skills for carrying out information and communication management (Morris 2007:19).

#### **4.7.6.2 Knowledge management practices**

Regardless of the rhetoric surrounding knowledge management (see definition of key terms in the preliminary pages and **section 4.1.6**), knowledge in the agricultural sector has been managed through different approaches, which are discussed briefly below. Various authors (Röling 2004:14) have emphasised that agricultural knowledge is “co-created” by multiple actors. As discussed in **section 4.4**, external and local knowledge play a key role in agricultural production (Koutsouris and Papadopoulos 1989:89; IIRR 1996:3; Mgumia 2001:1), and in managing natural resources (The World Bank 2010a:18). Knowledge therefore needs to be created, accumulated, communicated and leveraged in practice (Wenger 1998; O’Hara, Alani and Shadbolt 2002:1). However, because individual or group knowledge is personalised, it needs to be expressed in a manner that receivers can interpret (Alavi and Leidner 2001:110). Gîchere (2008:4) in fact argued that the citizens or elders aged above 80 years old were “walking libraries” and primary sources of knowledge that was invaluable. However, various authors (Ibui 2007:263-276; Ngulube and Lwoga 2009:101) have indicated that little attention has been devoted to documenting local knowledge, experience and practices of local communities. Many authors have emphasised the need to capture and record the local knowledge of rural people (Reij and Waters-Bayer 2001a:12; Chisenga 2002:17; Ngulube 2002:96,98; Oettie and Koelle 2003:9; Awad and Ghaziri 2004:2-3; Meyer 2005; Chikonzo 2006:138; Nyumba 2006:14; Gîchere 2008:4; Mondé 2008:16). Knowledge is often shared by word-of-mouth (IIRR 1996:13; Pidatala and Khan 2003:3; Santilli 2006:1), which makes it vulnerable to extinction (IIRR 1996:13).

The soft knowledge that is embedded in the practices and relationships within a group can be “managed” through CoPs (Choo 1998; Hildreth, Wright and Kimble 1999; O’Hara, Alani and Shadbolt 2002; Sallis and Jones 2002:24; Benzie *et al.* 2005:180,182; Du Plessis 2007:27-28) and the “learning space where both the tacit and explicit dimensions of knowledge are intertwined” is developed further (Nilsen 2006:5). Largely, CoPs depend on who constitutes the group, and the group’s practices, and the process of participation constructs group meaning Benzie *et al.* (2005:180,182). Nan (2008:104,107,111) suggested the need for incentives to induce the “knowers” to share what they know. In some cases, the local knowledge captured in people’s heads and practices was complemented with external knowledge from facilitators, and shared more widely through farmers’ meetings, field observations, field days and media (Malekmohammadi 2009:233). As earlier pointed out by Wenger, McDermott and Snyder (2002:6), knowledge communities facilitate the sharing of knowledge that resides in the minds of people, skills, tools, experiences, actions, and processes of community members, and farmers preferred knowledge they can access easily from their locality (McDowell 2004).

Various authors (Mchombu 1991:173; Pickering 1996:450; Mulira *et al.* 1999:486; Meyer 2003b; Stefano 2004:51; Nyumba 2006:14; Gîchere *et al.* 2008:26) observed that the old people had passed on traditional knowledge to the younger generations orally, and it was captured and stored in people’s heads. Other methods through which local knowledge has been recorded for use include cassette tapes, video, films, photographs or drawings, slides and databases (IIRR 1996:109; Woytek 1998:6-8), and orally through family members, peer groups and elders and folklore (Gîchere *et al.* 2008:26). Community based indigenous knowledge resource centres have been established in some areas, and farmers have been trained to capture and document their own knowledge (Von Liebenstein 2000:20). For example, the LinKS project in Tanzania has used community-based approaches to document the local knowledge of men and women on conservation of agrobiodiversity in form of reports, case studies, articles, videos and leaflets. These products have raised awareness of the value of local knowledge systems. In addition, the project has documented good practices on the management of agrobiodiversity (FAO LinKS Project 2003).

Different communities and organisations including The World Bank are using knowledge fairs to facilitate exchange of knowledge (McDermott 2003:30). Knowledge fairs are temporary gatherings of people, where they visit and talk about their work or experiences (Davenport and Prusak 1998:46,92), for example at trade shows or farmers’ markets. Different actors including farmers can, therefore, display their expertise and innovations and find new knowledge. In Uganda, BROSDI has used knowledge fairs and forums to share and disseminate agricultural knowledge and information (Karamagi Akiiki 2006:75). Other knowledge management practices that have been employed

include the After Action Reviews (AARs). Baird, Deacon and Holland (2000:187) described an AAR as a review method for a group to reflect on and learn, while increasing local reflection and broadening awareness. AARs capture knowledge regarding what happened while asking what we expected and what can we learn from the gap? (Senge 2006:279,290).

Advancements have been made in using ICTs to facilitate the capturing, processing and sharing of knowledge (Lunch 2004:1; Sen 2005:379; Abdullah *et al.* 2006; Fourie and Bothma 2006:470; Ocholla 2007:239; The World Bank 2009b). The internet, web sites, databases, DVD, cassette documentation, video, photographs and slides, have been used to record and access agricultural knowledge and information (Morris and Stilwell 2003; Stefano *et al.* 2005b; Karamagi Akiiki 2006; Kwake 2006; Matovelo, Msuya and De Smet 2006). In addition, Alavi and Tiwana (2002:1029-1030) pointed out the knowledge management system approach integrates and applies knowledge that is spread out or distributed. According to Alavi and Tiwana (2002), knowledge management teams had succeeded in capturing, coding and applying the explicit knowledge held by organisations and the unarticulated knowledge possessed by individuals. This approach has helped organisations to develop web-based knowledge repositories that contain best practices, techniques and guidelines.

Virtual teams can play a key role in linking the different agricultural actors within an AKIS to share agricultural information and knowledge, create new knowledge and exploit emerging opportunities. Alavi and Tiwana (2002:1035) note “most knowledge creation occurs within the context of social systems such as problem-solving groups.” Nevertheless, the integration of knowledge in virtual team environments has its constraints, including i) memories that may be sources of danger, ii) insufficient mutual understanding, iii) lack of sharing and linking of the knowledge to the context, and iv) inflexibility of organisational relationships. For Wiig (2004:xxiii), knowledge management accorded people the opportunity to work on the enterprises that they depend upon for their livelihood more “effectively and intelligently.”

Some NGOs and projects working with rural communities and projects have helped to capture, document and share agricultural knowledge using varied ICTs. As pointed out by Dalkir (2005:3) managing knowledge entailed three components – people, processes and technology, where the people include all actors who sought and shared knowledge, processes included the creation, gathering, documenting and storing and sharing of knowledge while technology enabled the analysis, storage and access to knowledge in more efficient ways (see **section 4.1.6**). In their audit of local knowledge systems in Kenya, Njiraini, Ocholla and Le Roux (2008) identified some institutions engaged in recording local knowledge systems. For example, the ALIN-EA and AfriAfya and partners have worked with rural communities and collected local knowledge that is repackaged in English and Kiswahili in form of “stories” (see **sections 4.7.2 and 4.7.6**). This content is then

uploaded on a web-based platform and is shared more widely through internet, e-mail, databases, WorldSpace radio, cellular phone, video, print and through face-to-face interactions (Munyua and Mureithi 2003; Munyua 2007). NGOs working with farmers on similar initiatives include the Participatory Ecological Land-Use Management (PELUM), Promoting Local Innovation (PROLINNOVA) and Oxfam Novib (2006; 2010). They have shown that in addition to capturing knowledge through traditional methods such as storytelling, dance and drama, ICTs such as video and digital photo have been successfully used.

The internet has become an important medium for capturing, processing and sharing knowledge. For example, farmers in Australia were using the web to capture and share agricultural knowledge and information, ideas and experiences (Easdown and Starasts 2004). In Uganda, BROSDI's CELAC project were using the "Web-to-Phone" tool that allows groups of farmers (up to 10) to share information freely through the project's website. CELAC was using the podcast, which allows farmers who are experts in a given agricultural area to record their knowledge (in the local language). This knowledge was then published on the project's website, and as audio CDs and was distributed to different farmers' groups (Karamagi 2008:16). The CELAC project was also uploading information from multiple sources on various web tools, such as the digital WorldSpace radio (see **section 4.7.3.2**).

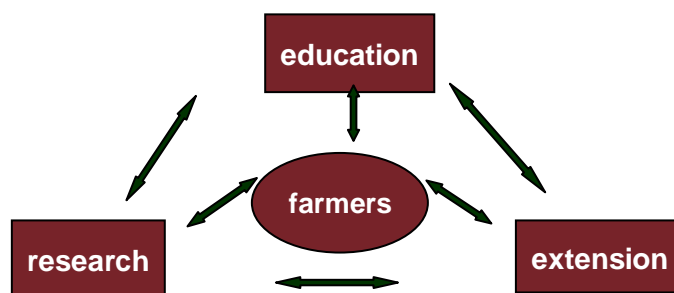
In spite of the various management practices, there were limited opportunities for sharing knowledge with other actors (Kristjanson *et al.* 2009:5051-5052). In addition, there were various barriers and constraints in managing local knowledge, which had been a topic of discussion and study by a number of authors (Nonaka and Takeuchi 1995; Choo 2000; Powell 2003:18; Awad and Ghaziri 2004:47; von Krogh, Ichijo and Nonaka 2000:6). Nonaka and Takeuchi (1995) pointed out that tacit knowledge not only contained technical elements (concrete know-how, crafts, and skills) but also "mental models" (schemata, paradigms, perspectives, beliefs, and viewpoints) that helped individuals perceive and define their world and was difficult to capture, or have prior understanding of (Wiig 2003). Mundy and Compton (1995:112) noted that inadequate attention had been paid to how knowledge is collected and shared at community level, while the IIRR (1996:3) observed that there were no guidelines for recording and applying it. Further, Von Liebenstein (2000:19-20) observed that there was inadequate involvement of knowledge generators in the processes of capturing, recording and storing of knowledge.

According to Karamagi Akiiki (2006:70), there was little knowledge sharing for personal development in rural areas. However, a study by Nwokeabia (2006:3) in Africa showed that there was more willingness to document and share local innovations where knowledge sharing networks had been established among local agriculturalists. In this regard, Du Plessis (2007:27-28) argued that

there was a need to build on earlier efforts on managing agricultural knowledge in order to facilitate knowing between actors and organisations, communication, joint learning and sense making. Chisenga (2002:19), Chikonzo (2006:138), Raseroka (2008:247), and Ngulube and Lwoga (2009:105) observed that knowledge captured and recorded did not benefit the “owners” of the knowledge. Other authors (Nwokeabia 2006; Kristjanson *et al.* 2009:5051-5052) noted that there were limited opportunities for farmers to share local knowledge. These findings pointed to Engel’s (1995) recommendation on the need to intensify research on knowledge management. Managing knowledge is important because “the success of humankind is going to largely depend on gathering, analyzing, storing, sharing and harnessing what other members of society know” (Ngulube 2002:95). In the face of these suggestions, and taking into account the challenges to managing knowledge, the present study of small-scale farmers captured the existing knowledge management practices in Kirinyaga district.

#### 4.8 AKIS models

Early AKIS authors focused on addressing research, extension and users of agricultural information (Röling 1988:xi). Scholars have advanced several two-way interactive AKIS models including the knowledge triangle, which comprises three key pillars or sub-systems namely research, extension and higher education (Eicher 1999:33). However, Eicher’s (1999) model did not showcase farmers and subsequently, the FAO and The World Bank (2000) improved upon the agricultural knowledge triangle and brought to light the purpose of the system, which was “to serve the farmers” or producers emphasising the importance of agriculture in rural development (AKIS/RD) (Rivera, Qamar and Mwandemere 2005:5) (see **Figure 1**).



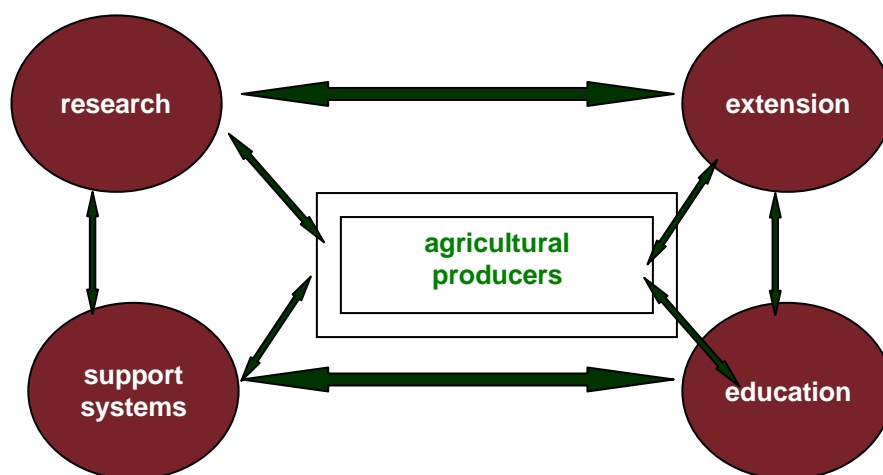
**Figure 1: The FAO and The World Bank AKIS / RD model**

(Source: FAO and The World Bank 2000)

However, the FAO and the World Bank model failed to recognise the important role of agricultural innovation and the importance of markets (Berdegúe and Escobar 2001). In addition, Rivera, Qamar and Mwandemere (2005:5-6) noted that the FAO and The World Bank (2000) model did not incorporate other key actors such as government, the private sector, civil society, markets, support



systems and knowledge and information. The shortcomings of the FAO and the World Bank model led to the development of the Pakistan four pillar model comprising the knowledge creation, knowledge diffusion, knowledge utilisation and agricultural support sub-systems. The agricultural support included various functions such as credit, market and input. Rivera, Qamar and Mwandemere (2005:5-6) improved upon the Pakistan model and placed agricultural producers at the core of the model, which was referred to as the idealised four pillar quadrangular model, comprising education, extension, research and support systems (Rivera, Qamar and Mwandemere 2005:6) (see **Figure 2**).

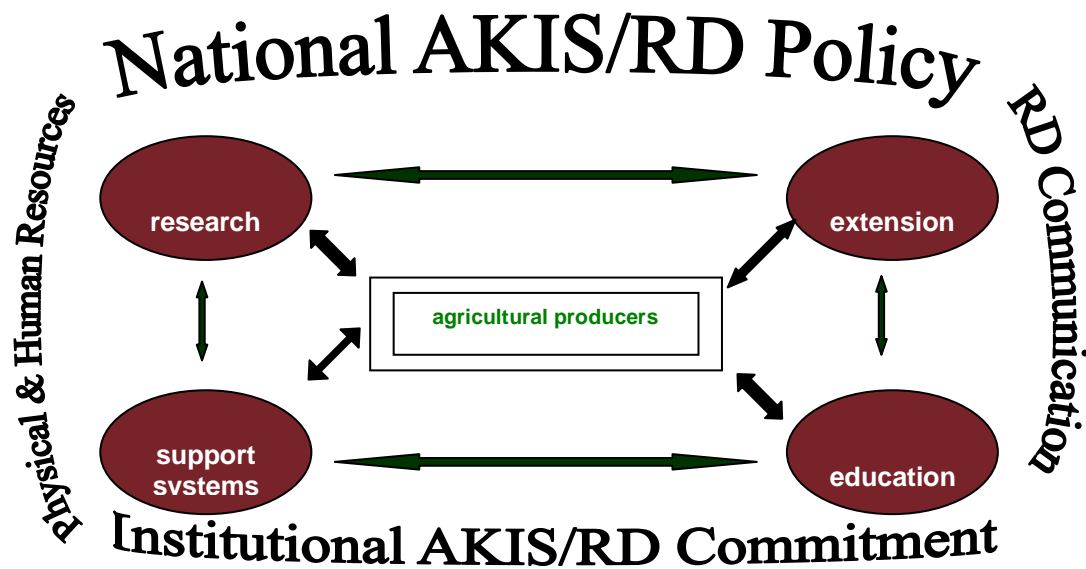


**Figure 2: Idealised four pillar AKIS model**

(Source: Rivera, Qamar and Mwandemere 2005:6)

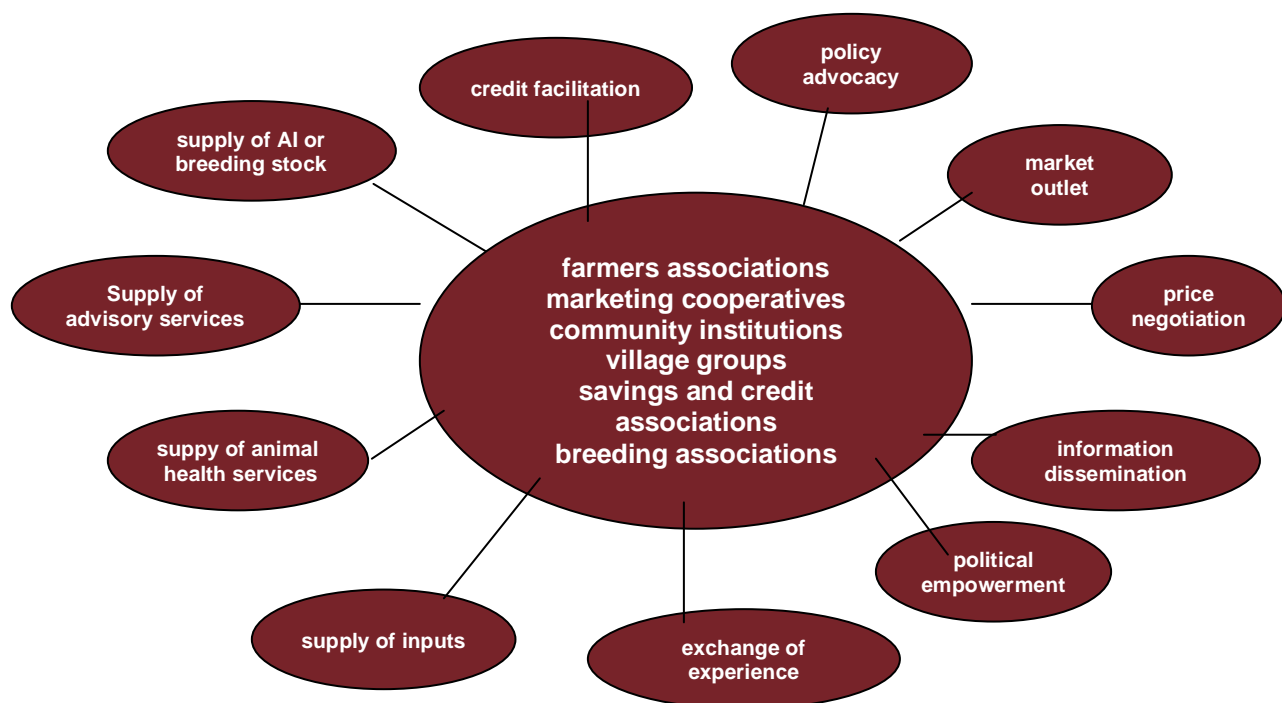
To improve upon the idealised four pillar model Rivera, Qamar and Mwandemere (2005:6) further improved upon the Pakistan model and factored-in government policy, institutional commitment, communication systems and physical and human resources, which were non-system components that were omitted in the Pakistan model to arrive at the Comprehensive AKIS / RD model (see **Figure 3** below).

Chipeta's model (Chipeta 2004:7; Rivera, Qamar and Mwandemere 2005:8) (see **Figure 4** above) was based on community driven development, and focused on non-system components. This model was all-inclusive on producers and included farmers' groups, associations, cooperatives and other community institutions. Chipeta's (2004:7) model highlighted the diverse types of services that livestock producers and small-scale farmers in general, as well as institutions could provide to members, by working together, identifying and pursuing their common needs such as credit facilitation, policy advocacy, political empowerment, market facilitation, information dissemination, supply of inputs, supply of advisory services / health services and exchange of experience.



**Figure 3: Comprehensive AKIS / RD model**

(Source: Rivera, Qamar and Mwandemere 2005:7)



**Figure 4: Multifaceted advantages of producer and community organisations**

(Source: Chipeta 2004:7; Rivera, Qamar and Mwandemere 2005:7)

The study by Castillo (2000:391) recommended the use of communication in facilitating the strengthening of linkages and interfaces between actors. Castillo (2000:391) stressed that it was important to analyse the information system with farmers being the focus, their communication,

usage of diverse sources of information and knowledge, and to explore their perceptions regarding their linkages with other actors.

Meyer's (2000:187; 2003) merger model was based on the transfer of agricultural information to small-scale farmers in rural communities, and underscored the need to integrate local and external knowledge systems in improving the flow of agricultural information and knowledge. The model was discussed in **section 3.2.3.2**.

The models discussed above notwithstanding Rölöing (2004:5,7) contended that new learning had showed that apart from farmers, educators, researchers and extensionists, the components in an AKIS included other important players such as local leaders, NGOs, the private sector as well as businessmen. According to Rölöing (2004), the components of an AKIS are determined by the "configuration of actors in a given 'theatre of innovation'," and "one cannot *a priori* limit an AKIS to extension agents, agricultural scientists and teachers." Rölöing (2004:14) emphasised that an AKIS is a temporary configuration of actors and institutions that share a specific interest in a given situation. This assertion suggested that an AKIS model could only be developed after carrying out an actor analysis and determining the key components. In other words, there is no generalised AKIS model as such, and that AKIS models were flexible, and specific to a given situation and time.

#### **4.9 Summary**

This Chapter reviewed the literature on the key AKIS concepts, followed by a brief historical background. It examined the relationship between knowledge management and AKIS and the roles of knowledge and information with emphasis on the importance of integrating local and external information and knowledge. It discussed the role of key actors, including small-scale farmers and farmers' groups, and mounted a landscape of AKIS studies providing global, African and Kenyan perspectives. The Chapter also covered the key thematic areas addressed by the present study, which focused on information needs and information seeking behaviour; sources of knowledge and information; linkages, flows of knowledge and information; the role of ICTs; usage of agricultural information and knowledge; barriers to accessing agricultural knowledge and information and the existing knowledge management and information management practices. Finally, Chapter four reviewed a succession of some AKIS models.

## CHAPTER FIVE: RESEARCH METHODOLOGY

### 5.0 Introduction

This Chapter provides details on the research design, the methodology and the procedures used in conducting the study. Pertinent areas covered include the population studied, the sample and sampling techniques used, variables measured, data collection methods, tools for data collection and pre-testing of the instruments and data analysis techniques. The Chapter also discusses reliability and validity, and ethical considerations. It does not repeat details about the approach in terms of paradigm, principle theories and frameworks.

### 5.1 Research methodology

Various authors pointed out that there is a linkage between paradigms and methodologies (Knox 2004:120; Creswell and Plano Clark 2007:5) and methods (Greene and Caracelli 2003:91; Teddlie and Tashakkori 2009:21) (see **Chapter three**). Paradigms provide lenses through which to view the world, research methodologies provide an approach to studying social science, while research methods provide strategies for doing research. On the other hand, theory is connected to the research activity and methods need to be viewed in the perspective of theory, and theory is related to methodology (Denzin 1978:3-4,6). Wilson (2002) held the thesis that “to state one’s methodological position is to describe one’s view of the nature of reality,” because methodology provides “the philosophical groundwork for methods.”

Methodology in social sciences takes into consideration the research design, gathering of data and its analysis, as well as theorising the social, ethical and political interests that affect the researcher (Burgess 1984:2). Dervin (1998:39) referred to methodology as “ways of thinking about and selecting research practices” as opposed to research methods. Dervin (1998; 2003a:126) argued that methodology denotes the theoretical analysis of methods, comprising the theory of “the methods of theorizing as well as theory of the methods of observing and analyzing.” Methodologies thus offer a framework for choosing the means for studying, analysing, ordering and exchanging information about important questions (Cornwall, Guijt and Welbourne 1994:98; Denzin 1978:6; Kothari 2004:7-8; Terre Blanche and Durrheim 2006:8; ). The framework includes the philosophical viewpoints, methods of inquiry, collection and analysis of data to provide a better understanding to the research problem (Creswell and Clark 2007:4,5; Teddlie and Tashakkori 2009:21), and helps to identify important variables to the research problem and their relationships (Sekaran 2003:98). Greene (2006:93-94) defined methodology by its constituent parts, which comprise i) paradigmatic and theoretical assumptions and stances, as well as the mental models of the researcher; ii) method of social inquiry (commonly referred to as methodology) and the reason or justification for the methodologies used; iii) guidelines for practice, which include sampling strategies, data collection

methods and data analysis methods; and iv) “sociopolitical commitments in science” pertaining to whose pursuit should be addressed by the approach and the reasons why.

The main methodologies or research approaches in social research include the i) quantitative, ii) qualitative (Bell 1987:4; Myers 1997; Babbie and Mouton 2001:49; Creswell 2003:20-21; Sheppard 2004; Durrheim 2006:44), iii) participatory action methodology (Babbie and Mouton 2001:49), iv) mixed methods research (Greene, Caracelli and Graham 1989; Creswell 2003:20-21; Creswell and Plano Clark 2007:4; Greene 2008:20; Teddlie and Tashakkori 2009:15) as well as the Sense-Making methodology (Dervin 1992; 1998; 2005; 2006; Mehra, Bishop and Bazzell 2000; Dervin, Foreman-Wernet and Lauterbach 2003; Romanello, Dervin and Fortner 2003; Clark 2005:2; Frenette 2005:1). Contributing to the discussion on methodology, Denzin and Lincoln (2005b:1) emphasised that both qualitative and quantitative research method[ologies] are scientific. Elsewhere, Bell (1987:4) noted qualitative and quantitative techniques have their strengths and weaknesses, while Byrne (2001) argued that there could be congruence or conflict with some research methodologies and methods. Various authors (Byrne 2001; Creswell 2003; Creswell and Plano Clark 2007) have advised that the choice of methodology and methods be guided by the research questions and the phenomena being observed. Despite the different methodologies for studying social sciences, Dervin (2003b:151,253) contended that there was a wide gap between research and practice in the field of communication. The Sense-Making methodology was therefore proposed as an alternative approach to study information behaviour (Dervin 1992; 1998; 1999; 2006; Dervin and Frenette 2001; Romanello, Dervin and Fortner 2003; Romanello 2005). The following section outlines various methodological approaches and provides justification for the adoption of the multiple methods methodology, which guided the present study.

### **5.1.1 Qualitative research methodology**

Qualitative research methods refer to “processes and meanings that are not rigorously examined or measured” (Denzin and Lincoln 1994:4); to non-statistical procedures such as research about people’s lives, experiences, behaviours, feelings or social movements, cultural phenomena, interactions or organisational functioning (Myers 1997). Various authors (Babbie and Mouton 2001:4; Sapsford and Jupp 2006:22; Teddlie and Tashakkori 2009:6) have described qualitative methods as those methods used where in-depth analysis is required, involving the collection of textual or verbal data, or graphic data. The data collected places emphasis on words as opposed to quantification in data collection and analysis or statistical summaries, and may be in the form of people’s words or descriptions of the researcher, based on observation and experience (Babbie and Mouton 2001:49,53; Bryman 2004:542; Denzin and Lincoln 2005b:3; Durrheim 2006:47; Sapsford and Jupp 2006:22). Thus, qualitative research emphasises the “socially constructed nature of reality” (Denzin and Lincoln 1994:4), an

holistic description of phenomena and is process oriented (Heck 2004:216), and uses complex descriptions to describe phenomena (Beins 2004:93; Leedy and Ormrod (2005:94).

Byrne (2001) argued that it would be difficult and inaccurate to describe qualitative research, without linking it to philosophical notions and methods. Denzin and Lincoln (2005b:3) described qualitative research as “a situated activity that locates the observer in the world” and provides multiple view points and approaches that use diverse techniques and data collection methods, which qualitatively describe and make sense or provide meaning to phenomena that is observed. Snape and Spencer (2003:22) concurred with Byrne (2001) that there are many approaches of qualitative research that are linked to different philosophical positions. Some authors have classified qualitative research methodology as belonging to the Constructivist or Participatory knowledge claims (Creswell 2003a:20-21); Naturalistic and Interpretive (Snape and Spencer 2003:3) and to the Constructivist or Interpretive or Post-positivist approach (Leedy and Ormrod 2005:94) (see **section 3.1.2**). Various authors (Denzin and Lincoln 2005b:11; Greene, Kreider and Mayer 2005:274) have highlighted the centrality of Interpretivism to qualitative methodology which employs a large number of interlinked interpretive practices. These practices view the world differently but blend different elements to yield a better understanding of processes, meanings and qualities of entities that cannot be measured such as lived experiences. For example, Greene, Kreider and Mayer (2005:274) emphasised the “interpretive, value-laden, contextual and contingent nature of social knowledge.”

Qualitative research is powerful for describing and understanding the processes, beliefs, and perceptions of the participants or subjects being studied and showing meaning (Firestone 1993:22; Willig 2001:9; Ritchie 2003:27-28; Babbie 2004:53). Techniques linked to qualitative research include interviews, observation and the diary method (Burgess 1984:viii; Patton 2002:4; Ritchie 2003:35; Denzin and Lincoln 2005b:3), action research, case study research, ethnography (Myers 1997), group discussions, narratives and analysis of documentary evidence (Ritchie 2003:35; Snape and Spencer 2003:3). Additional methods identified by Denzin and Lincoln (2005b:3) include personal experience, introspection, life story, artefacts, cultural texts and productions, historical, international and visual texts.

Though debatable, Firestone (1993:22) suggested that qualitative research was useful in drawing analytical generalisations especially those linking cases and theories. In support of this suggestion, Lewis and Ritchie (2003:263,277) argued that although the debate on whether qualitative findings could be generalised or not was ongoing, it was generally agreed that some findings could be generalised if a framework within which generalisation can occur had been properly defined. However, caution needs to be taken to ensure that the meaning of interpretations assigned are clarified. Lewis and Ritchie (2003) point out limitations to making generalisations and advance the

following principles: the i) need to use original data that supports the phenomena being investigated, ii) need to include diversity to capture the different behaviours, needs and perspectives in the population, iii) need to focus on the nature of the phenomenon being studied and not the statistical distribution, iv) need to classify phenomenon into different levels, v) the need to assign meaning and interpretation to phenomena at different levels, and vi) validation of inferences to ensure verification with other sources.

Among the advantages of qualitative studies, Jick (1979:609) posited that qualitative methods provide the “glue that cements the interpretation of multimethod results.” According to Flick (2002:2), qualitative research has relevance in conducting social science studies, as qualitative methods allow the researcher to carry out in-depth analysis of phenomena hence are more detailed, rich and variable in content (Hair, Bush and Ortinau 2003:214). This detail permits the researcher to understand and capture points of view of different people without predetermining their responses (Patton 2002:14,20,21; Durrheim 2006:47). In addition, qualitative research can tell more about people’s experience and perceptions than quantitative research (Durrheim and Painter 2006:132). Furthermore, qualitative methods present a “multiperspective approach” that uses several techniques and data gathering methods that make sense of, interpret and reconstruct meaning (Denzin and Lincoln (2005b:3).

Despite the advantages outlined above, the qualitative research methodology has its limitations. Some authors consider qualitative work inadequate for making generalisations because the samples used may not be representative of the population (Firestone 1993:22; Hair, Bush and Ortinau 2003:214; Kelly 2006b:381). In some cases, the sample selected may not be “able to provide the most relevant, comprehensive and rich information” (Lewis 2003:49) or may not apply to those referred to in the research question (Wassenaar 2006:71) (see **section 5.4.2**). Flirt (2002:3-4) cited various authors who considered qualitative research to be unscientific, influenced by interests and culture and lacking in objectivity in producing “absolute truths” that can be adopted. Other authors observed that there are difficulties in analysing the varied qualitative data and challenges in capturing field notes promptly to reflect participation and observations (Patton 2002:20,21,306); in finding well trained qualitative investigators and that qualitative methods lack reliability and validity (Hair, Bush and Ortinau 2003:214). Some contended that it is difficult for researchers to gain access to the private experiences of those being studied (Easterby-Smith, Thorpe and Lowe 2002:129); that studies based on the qualitative methodology require adequate planning, preparation, good observation and interviewing skills (Leedy and Ormrod 2005:101), and were open to bias (Durrheim and Painter 2006:132).

Nevertheless, the advantages of qualitative research outweighed the disadvantages and this methodology has been widely adopted in the social sciences. Qualitative research has, for example been used to study “information seeking” and user studies by a number of authors (Wilson 1981a; Kaniki 1989; Mchombu 1992; 1993; Sturges and Chimseu 1996a; 1996b), and in AKIS studies (Rees *et al.* 2000; Garforth 2001a; Garforth, Khatiwada and Campbell 2003; Stefano *et al.* 2005a).

### **5.1.2 Quantitative research methodology**

Duffy (1987:130), observed that the quantitative methodology was dominant in early studies, and quantitative methodology was originally developed to study natural phenomena in the natural sciences (Myers 1997). Quantitative research methodology has been described as a research strategy that emphasises numbers in the collection of data and statistical analysis (Bryman 2004:19; UKZN. School of Education, Training and Development 2003:59; Durrheim 2006:47; Sapsford and Jupp 2006:20). The objective of quantitative research is to provide facts that can be applied to predict, explain causality, and validate existing relationships among variables through translation of numerical data (Hair, Bush and Ortinau 2003:212; Leedy and Ormrod 2005:94). Although Creswell (2003:20-21) categorised quantitative research under the post-positivist knowledge claims, Leedy and Ormrod (2005:94) contested that quantitative methodology was based on the positivist paradigm.

Techniques of gathering quantitative data include survey methods, experiments (Myers 1997), questionnaires, interviews, tests/measures and observation (Easterby-Smith, Thorpe and Lowe 2002:130). Although some authors argued that in the past, social scientists favoured quantitative over qualitative research because of the widespread acceptance of the positivist paradigm, Quantitative data is gathered through direct measurement using structured questionnaires or observation (Stack 2004:115). Bryman (2004:19) added that quantitative research conforms to a deductive approach and links theory and research. Proponents of quantitative methods emphasise reality, objectivity and causal explanation (Greene, Kreider and Mayer 2005:274). Analysis of quantitative data is a way of comparison, which according to Sapsford and Jupp (2006:20) is a central logical device that establishes the validity of a line of argument, showing how findings diverge from expectations.

Strengths of quantitative research methodology include its ability to provide the researcher with adequate detail to ‘make sense’, guide conclusions and show patterns across different contexts and environments (Firestone 1987:19,20). Quantitative methods facilitate comparison and statistical aggregation of data using measurement of reactions of many people and a limited set to questions (Patton 2002:14). Data from quantitative methods is considered systematic, standardised and hence findings are considered to be objectively measured to justify the broad and generalisable comparisons (Patton 2002:14; Durrheim 2006:47; Durrheim and Painter 2006:132). It is also believed that good quality quantitative data allows the researcher to compare different situations (Durrheim and Painter



2006:132). In addition, the statistical analysis of quantitative data is considered advantageous in that it helps to explain concepts using numerical analysis and statistical tests (Cohen, Manion and Morrison (2007:501).

Critics of quantitative research methodology have argued that quantitative methods are inappropriate for studying human behaviour (Wilson 1999). Others have argued that quantitative methods require the use of standardised measures or predetermined categories (Patton 2002:14). Nonetheless, Wilson (2006a:681) asserted that quantitative methods have a role to play in conducting information needs, and Durrheim and Painter (2006:132) underscored the popularity of this research methodology. Despite its popularity, only a few authors including Garforth (2001a) have used quantitative methods for studying AKIS.

### **5.1.3 Mixed methods research methodology**

Despite the debates on the use of qualitative (constructivism), quantitative (postpositivism) and mixed (pragmatism) methodological communities, mixed methods research has become popular in social science research (Tashakkori and Teddlie 2003:213; Greene 2008:20; Teddlie and Tashakkori 2009:8,22), and is acknowledged as the third research methodology (Teddlie and Tashakkori 2009:23). Mixed methods research is relatively young (about 20 years old), but the approach has gained interest over the years (Jick 1979; Duffy 1987; Firestone 1987; Tashakkori and Teddlie 1998; 2008; Greene and Caracelli 2003; Creswell 2003; 2008; Bryman 2006; 2008a; Creswell and Plano Clark 2007; Teddlie and Tashakkori 2003; 2009; Hesse-Biber 2010). Many authors (Teddlie and Tashakkori 2003:11; Bergman 2008b:1; Johnson and Christensen 2008:441; Bryman 2008b:15; Hesse-Biber 2010:3) thus describe mixed methods as an approach employing a design that combines qualitative and quantitative data in responding to research questions. As noted by Greene, Caracelli and Graham (1989:264) and Greene and Caracelli (2003:107), mixed research studies were implemented through dichotomous research designs from different methodologies.

According to Jick (1979:602,608-609), there is a tradition of literature in the social sciences that advocated for the triangulation of methodologies. The logical mix of multiple methods was considered useful, regardless to whether there was convergence or not in the mixing of methodologies. Jick (1979:602,608-609) reasoned that while convergence could help to increase confidence in results, inconsistencies could equally help to explain a research problem. Supporting the combination of methodologies, Firestone (1987:16,20) asserted that a mix of qualitative and quantitative methodologies presented the researcher with different information that could be used to gain “greater confidence in one’s conclusions.” Other authors (Duffy 1987:133; Teddlie and Tashakkori 2009:14) concurred with this reasoning and added that qualitative and quantitative methodologies could indeed coexist, and that there was mileage to be gained in triangulating

methodologies because the blending encouraged research creativity and suggested the need to evaluate the research question(s) against the appropriate methods for answering the question(s).

A review by Greene, Caracelli and Graham (1989:259) suggest five reasons for mixing methodologies namely i) triangulation of methods, which leads to multiple dimensions, convergence or corroboration that enhance credibility; ii) complementarity which leads to elaboration or clarification thus leading to a better understanding of the research problem; iii) development of synergistic effects that help to inform other methods; iv) initiation of new areas that lead to discovery, contradictions, or further research; and v) expansion of knowledge by using different methods. Emphasising the importance of mixed methods methodology, Rocco *et al.* (2003:20) concluded that triangulation of methodologies provide an approach for providing insight into relationships between methods used. In fact, Waring (2000:2) considered it naive and a mistake to adopt only one approach and asserted that “methodologies are best used in a complementary way to ensure the bigger picture is not lost.” Advocates of mixed methods have argued the integration of data collection methods offer a “complete” picture (Ngulube 2005:140); it captures “the best of both ... approaches” (Creswell 2003:22); and because inductive and deductive approaches are interlinked it was necessary to align the tools and approaches, in order to avoid confusion throughout the research process (Knox 2004:119-120). Knox (2004:120) equated the methodological linkages to the continuum of Kolb’s learning stages and explained that there was a place for both induction and deduction at various stages of conducting research. Bawden (2006) concluded that the use of single methodologies that characterise most research in the social sciences has become unusual, and a mixed research design is now the norm in studying information seeking and use.

Although Patton (2002:5,193-194) and Bawden (2006) observed that studies employing multiple methodologies are common, in reality very few can be traced in library and information studies. This observation is confirmed by a recent study conducted in South Africa, which showed that there is limited application of mixed methods in library and information studies (Ngulube, Mokwatlo and Nwandwe 2009:111). Among the few researchers who employed mixed methods research was Wilson (1981a), who combined quantitative and qualitative methods in a case study exploring innovative information provision, and concluded that the mixing of methodologies provided a better approach to gathering qualitative data that was more meaningful. Wilson (1981a) perceived mixed qualitative or quantitative methods to be a more sensitive approach to data collection in information science than the single method approach. Burgess (1984:vii) observed that most research used mixed qualitative and quantitative methods.

A study of information systems by Kaplan and Duchon’s (1988:581-582) concluded that although there were difficulties in combining qualitative and quantitative approaches, the mix was beneficial

because limitations of one methodology were addressed by the alternative. Indeed, Pratt and Loizos (1992:46) emphasised that qualitative work is essentially the pre-cursor for quantitative work and determined the level of accuracy with which results are predicted. It was later observed that researchers investigating human behaviour are shifting from quantitative to qualitative methods and theories of social sciences are being applied (Wilson 1999:250; 2000:51). Mixed research methods have been used in studies on information seeking, information needs, users and AKIS (Rees *et al.* 2000; Garforth, Khatiwada and Campbell 2003) and to study technology dissemination among small-scale farmers (Davis 2004:55).

Nevertheless, there is overwhelming agreement that: i) the choice of research methods was dependent on the research question and context of the study, and that results from mixed methods (for data gathering and analysis) optimised the strengths of the different research approaches (Wilson 1981a; Creswell 1994:177-178; 2003; Flirt 2002:40; Leedy and Ormrod 2005:97; Creswell and Plano Clark 2007:10; Hesser-Biber 2010:10-12); ii) mixed methods had the potential to enrich the understanding of problems being investigated and to generate new insights (Hoskisson *et al.* 1999:419; Esteves and Pastor 2004:74,80; Creswell and Plano Clark 2007:9); iii) increased the robustness of research results (Esteves and Pastor 2004:74,80); and iv) facilitated the collection of data that were more reliable and rounded (Cohen, Manion and Morrison 2007:96). In other words, research could use multiple methodologies and data gathering and analysis approaches to yield complementary information leading to stronger inferences, credible conclusions and a better understanding of phenomena (Teddlie and Tashakkori 2003:11,14-15; Greene, Kreider and Mayer 2005:274-275; Johnson and Christensen 2008:444). Other reasons included answering research questions that other methods could not answer, providing complete data, contributing to the development of methodologies, compensation, diversity of view points and data sources, confirmation of results and improving validity (Greene and Caracelli 2003:103-105; Teddlie and Tashakkori 2003:15-17; Creswell and Plano Clark 2007:9; Tashakkori and Teddlie 2008:103,105). In addition, mixed methods can yield “fuller, deeper and more meaningful answers,” combines images, words and narratives to enrich meanings of numbers, and yields integrated knowledge which sheds light on theory and practice (Johnson and Christensen 2008:444).

On the other hand, critics of mixed-methods have argued that: i) it is difficult to discern the link between two methods (De Vos 1998:360; Johnson and Christensen 2008:444) because the paradigms for the two designs are different and at opposite polar positions (De Vos 1998:360); ii) combining quantitative and qualitative methods could be expensive in terms of time, energy and resources to gather and analyse the data (Creswell 2003; Creswell and Plano Clark 2007:10; Johnson and Christensen 2008:444; Hesse-Biber 2010:21); iii) the investigator(s) or researcher(s) may not have all the skills required for mixed methods (Mugenda and Mugenda 2003:156; Creswell, Plano Clark and

Garret 2008:80; Hesse-Biber 2010:21); iv) could complicate the research process (Knox 2004:119; Johnson and Christensen 2008:444). For example, Greene, Kreider and Mayer (2005:276-279), argued that it is difficult to judge the quality of mixed-method inquiry where different philosophies have been integrated as data analysis becomes complex and challenging. They explained that planning mixed-method studies is iterative and various research stages are repeated for different methods. v) Although findings from mixed-methods may present convergent results, at times the results may be divergent and lead to contradictions in interpreting qualitative and quantitative data sets. vi) Other limitations cited in the literature were the introduction of bias (Creswell, Plano Clark and Garret 2008:75) and vii) quality issues for data and data analysis (Tashakkori and Teddlie (2008:117). Despite the complexities and challenges of mixed methods, Greene, Kreider and Mayer (2005:279) concluded that they are a worthwhile approach.

Creswell's (1994:177-178) Chapter on combined qualitative and quantitative designs suggested three models: i) the two-phase design where the researcher conducts the qualitative phase followed by the quantitative phase separately; ii) the dominant-less-dominant design, where the study is presented within one major paradigm and only a small component of alternative school of thought and iii) the mixed methodology design that represents a high degree of mixing paradigms of the three designs. Later, Creswell (2003:16) described three combination or implementation strategies namely i) sequential procedures where the researcher uses one method (qualitative or quantitative) to expand on another in chronological order; ii) concurrent procedures where qualitative and quantitative data is collected at the same time (one form of data fits inside another in a parallel or synchronous manner) to analyse different questions that are brought together and the information is integrated in the interpretation; and iii) transformative procedures, where the theoretical lens forms the foundation for the mixed qualitative and quantitative data collected either sequentially or concurrently.

Although there were other classifications of mixed methods research designs, the main configurations were sequential and concurrent (Creswell *et al.* 2003:218; Creswell, Plano Clark 2007: 117; Creswell, Plano Clark and Garrett 2008:66). Creswell *et al.* (2003:226,230) and Teddlie and Tashakkori (2003:225-226; 2006:17,23) referred to the transformative design of combining methodologies outlined above as the conversion strategy, and described it as a multistrand concurrent implementation design, where qualitative and quantitative approaches are applied in all stages of data transformation, that is quantitative data are converted into narratives or qualitative data are converted into numbers for further analysis. Additional strategies that have been advanced include: iv) the fully integrated design where qualitative and quantitative approaches occurred interactively at all stages of the study (Teddlie and Tashakkori 2006:23-24); v) parallel; vi) conversion; and vii) multilevel (Teddlie and Tashakkori (2009:141,151).

Johnson and Christensen (2008:440) note that the literature is confusing in the sense that the terms “mixed research, mixed methods research, mixed method research, mixed methodology, multimethod research, multiplism” and mixed mode (De Leeuw and Hox 2008:138) are all used interchangeably. Although Greene (2006:95) observed that “a [mixed] methodology – or ... multiple methodologies for mixed methods social inquiry” is still in development, this study applied a unique multiple methods design. The present study adopted the term “multiple methods” in place of “mixed methods,” which in the opinion of the author best described the complex and multifaceted study of the AKIS of small-scale farmers in Kirinyaga district. The study is based on a pluralistic paradigm and theories, multiple methodologies and multiple data collection methods. More specifically, mixed methods research (qualitative and quantitative methodologies), Participatory methodology (see **section 5.1.4** below) and the Sense-Making methodology (see **section 5.1.5** below) were used. Qualitative research methods were dominant and were used to identify the information behaviour of small-scale farmers, to investigate the linkages and flows of knowledge and information between stakeholders, to find out how farmers make decisions, how they solve problems, how they innovate, the processes involved in individual and group decision making and to establish the existing knowledge management and information management practices. Quantitative research methods were used to collect quantitative data such as providers of agricultural related information, where farmers get their agricultural-related knowledge and information and the channels of communication and ICTs used. The Sense-Making methodology was applied in conducting interviews and focus group discussions and focused on information needs, seeking and use as well as users; while the participatory methodology was applied in gathering data through selected PRA tools and RAAKS windows.

The present study adopted the transformative procedures design for determining the combination of the multi-methods design (Marsland *et al.* 2000:5; Creswell *et al.* 2003:226,230; Creswell, Plano Clark 2007: 117), which was applied concurrently in two phases. The first phase facilitated the collection of qualitative and quantitative data, which were collected through interviews, focus group discussions, observation and PRA. Under the second phase, questionnaires were sent to information providers and RAAKS tools were used to expand on the data already collected (see **section 5.5**).

#### **5.1.4 Participatory research methodology**

Pratt and Loizos(1992:46) pointed out that research touching on development issues required not only quantitative and qualitative aspects, but also participation of local people (stakeholders). Further, Abagi (1995:20) observed that participatory research was gaining prominence in social research. Participatory research is defined as an “approach to data collection that is two directional, researcher to subject [participant], and from subject [participant] to researcher” that is dynamic, demand-driven and change oriented (Narayan 1996:20-21). On the other hand, Bellon (2001:1)

posited that participatory research is a “systematic dialogue between farmers and scientists to solve problems.” According to Narayan (1996:20-21), the collaborative process raises awareness and capacity by equipping the participants with new skills to analyse and solve their problems as well as generate and use knowledge. Involving users in decision making for follow-up actions helps to build local capacity.

Several participatory research approaches have been advanced including PAR, rapid rural appraisal (RRA) and PRA (Pretty 1994; Pretty and Vodouhe 1997; Kumar 2002; Bhana 2006:430,432), PRA and the RAAKS methodology (Engel and Salomon 1997; Röling 2004) (see **section 5.5.1**). As noted by Waring (2002:50), action research has emerged as a research methodology for studying information systems. Various authors (Den Biggelaar and Mugo 1996; Salomon and Engel 1997a; Rees *et al.* 2000; Stefano *et al.* 2009) have used action research methodology in the study of social interactions in an AKIS. However, Pratt and Loizos (1992:9) cautioned that there were limitations on the degree to which a researcher should allow for participation. In compliance with the recommendation by Pratt and Loizos (1992:46), the present study combined the quantitative, qualitative, Sense-Making and participatory methodologies to study the AKIS of small-scale farmers in Kirinyaga district, Kenya.

#### **5.1.5 Sense-Making methodology**

Dervin and Nilan (1986) suggested the need for a shift in the methodologies used to study information needs, seeking and use, and this mind shift saw the development of the Sense-Making methodology in 1972 by Brenda Dervin and colleagues (Dervin 1992; 1998; 1999:728; 2007; Dervin and anonymous students 1997; Dervin, Foreman-Wernet and Lauterbach 2003:vi), that is linked to Dervin’s Sense making theory (see **section 3.2.2.1**). This methodology considers time, space, movement, gap, step taking, situation, bridge and outcome to be the central foundational concepts of sense making (Dervin 1998:39). The methodology visualises humans as intelligent beings who are creative and can make sense by incorporating knowledge from within themselves and the external world to facilitate forward movement along their learning process (Gluck 1997:54,55). The Sense-Making methodology operates on a "situation/gap/use" framework that produces a scene or setting for understanding behaviour of a community focusing on a specific activity (Mehra, Bishop and Bazzell 2000). The methodology thus advances a model that conceptualises messages as constructions (as opposed to “things to be gotten”), that pertain to specific “times, places and perspectives” of the originators. These messages become of value when they are understood from the perspectives of the users’ circumstances (Foreman-Wernet 2003:5,6,9).

In short, the methodology focuses on how individuals connect, how they construct bridges and what causes the differences in observations (Foreman-Wernet 2003:7). In the case of the present study, the

specific scenario would be resolving knowledge and information concerns of small-scale farmers in rural communities. The Sense-Making methodology is informed by multiple research traditions including the qualitative, quantitative, critical and administrative (Dervin 1999:728; 2006:5), and is based on the realist foundational definitions of information, subjectivist, constructionist and verbings approach (Dervin 1999:745). Sense-Making borrows from the work on information needs, seeking and use as well as users, such as that carried out in library and information science and communication (Dervin 1999:728; 2003a:111,130; 2006:5). The goal of Sense-Making is to establish what users really think, feel, want and dream within a diverse and complex social context (Dervin 1998:739; 2005; 2006:8; Romanello, Dervin and Fortner 2003; Dervin and Reinhard 2006). The Sense-Making methodology thus helps to thoroughly unpack complex interactional relationships within social settings (Clark 2005:2).

As later asserted by Reinhard (2007:3) “to understand complexity, one needs to think complexly. Having a dialogic disciplinary approach empowers such complexity.” Emphasising the importance of dialogic partnership in research, Dervin (2006a:8) argued that most past user studies and projects in social sciences (pure and applied) had failed because these studies did not take the situations within which the studies were conducted into consideration. Further, Linderman (2007:3) pointed out that the dialogic approach is based on the premise that individuals need the intervention of an interviewer, to lead them through a time line probing that helps them recall, “how they constructed meaning in the solving of challenges and problems.” The methodology addresses the “hows of communicating,” the practice of communication in real life settings and deals with communication from the users’ or receivers end (Foreman-Wernet 2003:5,6,9). For example, the Sense-Making methodology facilitates persuasive arguments that make sense to professionals [or small-scale farmers in the present study] who can be deconstructed and reconstructed and emphasises the necessity of understanding of the points of view of other people (Frennette 2005:1). According to Naumer, Fisher and Dervin (2008), the Sense-Making methodology facilitates the bridging of research paradigms and traditions between branches of knowledge, researchers and practitioners.

The Sense-Making methodology, therefore, subscribes to respondents using their own terms to define what is ‘informing’, in the context of knowledge management (Dervin’s 1998:40). According to Dervin (1999:730), Sense-Making falls between “chaos and order, structure and person, facts and illusions, external worlds and inner, universals and particulars, and posits reality as being partially ordered, chaotic and evolving” depending on the circumstances of individuals. Thus, “knowledge made today is rarely perfectly suited to application tomorrow, and in some cases becomes tomorrow’s gap.” This statement implies that people make and unmake sense out of situational conditions that are dynamic (through time-space). Further, the Sense-Making methodology offers new interests such as emotions, hunches, wishes and dreams that were traditionally overlooked

(Dervin 1999:746). There is thus a need to create meaning, and to ascertain the differences between what individuals observe based on their experiences (Foreman-Wernet 2003:7). Elsewhere, Foreman-Wernet (2005:2) indicated that the Sense-Making methodology provides an approach that permits the investigation of complex issues and makes apparent the process of making meaning. The methodology guides not only data collection but data analysis as well and therefore can be viewed as “a dialogic approach to conceptualizing, interviewing and analyzing” (Dervin 2006b:5,8).

Among the key assumptions of this methodology include the need to focus on users in the mindsets that hold meaning for the daily activities of small-scale farmers, and not impose frameworks of the researchers’ system structures and expertises. In other words, the methodology permits for the learning of how users see researchers looking at them, as well as how users see themselves in their own situations as users (Dervin 2006a). The Sense-Making methodology assumes life in a world of gaps in an individual’s knowledge and information, which changes across time and space (Dervin 1992; 1998:36; Mehra, Bishop and Bazzell 2000; Clark 2005:2; Frenette 2005:1). Further, Sense-Making assumes that if gainful research on the design and practice of communication is to be generated, then communication should be studied communicatively (Dervin 1998:39). This is to say that the activities and verbs of communication activities need to be adapted to suit communicative purposes, to consider users to be dialogic partners, and to focus on sense making and sense unmaking (Dervin 2006a; Dervin and Reinhard 2006). This duality implies that people make and unmake sense out of situational conditions that are dynamic (through time-space) (Dervin 1999:728; 2006:5). In sum, the Sense-Making methodology permits people to describe their specific situations that lead them to seek information, to explore the steps taken to address barriers to finding the information they need, and to establish how the information needed is applied and how it has helped users (Mehra, Bishop and Bazzell 2000).

This methodology makes several other assumptions which are interwoven including: i) the nature of human beings, the human body, mind and spirit living in time-space moves through the past, present and future all anchored in material conditions that have capacity to make sense; ii) the nature of reality; and iii) the nature of knowing (Dervin 1999:730). In addition, the Sense-Making methodology is based on three assumptions regarding communication practice: i) it is possible to design and implement communication systems and practices that respond to human needs, ii) it is possible for humans to broaden their communication skills to pursue this vision and iii) these outcomes require the development of communication-based methodological approaches (Dervin 2005a). Brown and Sice (2005:34) summed the latter assumptions by stating “research into social systems inevitably involves and relies on human communication.” They stressed the need for “languageing” and suggested the use of new metaphors among other second order methodologies in creating reality.



The Sense-Making methodology is operationalised through an interviewing technique that poses neutral questions following a “time line” that follows the situation-gap-use schema, and patches up multiple variables including time, space, affiliation or affinity (Tidline 2005:113,115). It does not make *a priori* assumptions for the collection and analysis of data, but rather allows data to be analysed in small units by fixing moments in time and space, and recognising situational changes within the individual (Dervin and Frenette 2001; Romanello 2005:2). As pointed out by Dervin and Clark (2003:167,170), individuals make up society, culture and institutions, and these collective entities exist because of the powerful behaviour of individuals. Focus is therefore on the processes or acts of “connecting and disconnecting, constructing and deconstructing, imagining and changing, on the communications which connect and disconnect individual, culture, institution, society.” Studies conducted by Dervin and Reinhard (2006) pointed to some underlying preconditions for dialoguing including i) thinking and understanding of self, ii) thinking and understanding others, and iii) sharing of individual views with others to bridge the gap and the barriers of power, structure, tradition and habit. The dialogic process calls for deep listening, building empathy and well-structured communications.

However, the Sense-Making methodology has several limitations. Dervin (1999:744) pointed out that human beings have weaknesses, hence an individual could act as a barrier between the person and information and what a system considers the ideal situation. In addition, some authors have argued that the Sense-Making methodology does not permit real consultation to take place, as the process is led by the researcher (Cheuk 2005:2). As pointed out by various authors (Foreman-Wernet 2003:7; Tidline 2005:114), the Sense-Making methodology is appropriate for explaining individual behaviour and communication processes but is weak for groups. These shortcomings could be avoided by combining the methodology with other theories that link well with the Sense-Making methodology such as Nahl’s Affective Load, Wieck and Checkland’s approach to sense making, narrative analysis (Tidline 2005:115-116), and Wilson’s model (Wilson 2005:35).

Despite its limitations, the Sense-Making methodology has been widely used in both quantitative and qualitative research in various disciplines (Dervin and Frenette (2001) in the context of knowledge management to design communication, knowledge systems; knowledge seeking studies (Dervin 1998:43-44; Mehra, Bishop and Bazzell 2000; Cheuk 2005; Foreman-Wernet 2005; Frenette 2005; Dervin 2006b; Dervin and Reinhard 2006; Linderman 2007; Reinhard 2007); to guide studies on assessing and predicting information behaviour, communication and interaction in a community; and to study information systems (Dervin 1998:40; 1999:728; 2006:5; Cheuk and Dervin 1999; Nilan and Dervin 1999; Romanello, Dervin and Fortner 2003) and information science (Dervin 1999); to inform communication where there are differences in decision making processes, handling of uncertainty and

culture (Romanello, Dervin and Fortner 2003); and in developing a knowledge and learning CoP (Cheuk 2005:1). According to Dervin (2003b:254), Sense-Making commences with the user or receiver, who looks at the use of a message in the confines of the user's present, past, and expected future, and within specific contexts, within which they make sense of their worlds. The receivers define how the message impacts on them, and different users may make different sense of the same message. Focusing on community information systems, Mehra, Bishop and Bazzell (2000) stressed the need to address the "information needs, situational attributes and sociocultural contexts" of the community being investigated in order to bridge the existing information gaps.

Considering its widespread application in information seeking and use studies in a number of disciplines (Romanello, Dervin and Fortner 2003), the present study carefully applied the Sense-Making methodology, which provided the researcher with the necessary foundation for this complex, diverse and dynamic study. The methodology facilitated the interpretive and phenomenological (see **section 3.1.2.2**) understanding of information behaviour, and the studying of information needs, seeking behaviour and interactions of the different agricultural actors in Kirinyaga district. The Sense-Making methodology also guided the investigation on how small-scale farmers make decisions, solve problems and learn. Finally, the methodology facilitated the analysis of the AKIS of small-scale farmers and their segregation by membership, gender and enterprise.

## **5.2 Triangulation**

Although triangulation was traditionally linked to validity checking, the term has a wider application and has no clear-cut definition. Triangulation has several definitions depending on the purposes based on the paradigm(s) and the methodologies upon which the study is based (Hammersley 2008:22-23). Some authors have depicted triangulation as a design where a researcher seeks to obtain information from "two or more vantage points"; combine investigators and theories (Pretty 1994:38; Hammersley 2008:23); combine methodologies, paradigms and sources of information (Sheppard 2004:234-235; Hammersley 2008:27-30); combine multiple methods of gathering data from diverse sources (Pretty 1994:38; Sheppard 2004:234-235; Kelly 2006a:287; Cohen, Manion and Morrison 2007:140); for validity checking (Hammersley 2008:23); to combine theories (Denzin (1978:15; 2009:301-310).

Denzin (1978:15; 2009:301-310) defined triangulation as the application of multiple methods in the analysis of a research event or the combining of methodologies in studying the same phenomenon in a single study. Denzin (1978) advanced four types of triangulation namely i) data triangulation which entails gathering data through different sampling strategies and from the same or different data sources, which may be from the same method; ii) investigator triangulation, where multiple skilled researchers participate; iii) theory triangulation, where more than one theory of value is used to

provide multiple views; and iv) methodological triangulation (within method and between method) balanced in a manner that increases validity. Janesick (1994:215) described a fifth type of triangulation – interdisciplinary triangulation. Kelly (2006b:380) defined triangulation as the “use of multiple perspectives against which to check one’s own position.” As emphasised by Wilson (2006a:681), it is important for researchers to use multiple methods of research or triangulation to address complex studies (see **section 5.1.3**).

According to Leedy and Ormrod (2005:99) triangulation is more common in qualitative research and mixed method designs. Triangulation has various advantages including: providing an “holistic work”; increasing confidence in research data; strengthening the research design; stimulating the invention of innovative methods and revealing findings that are unique (Jick 1979:608-609). Although some researchers have argued that triangulation is expensive, many authors support the use of two or more methods to strengthen a study (Frankfort-Nachmias and Nachmias 1996:205; Patton 2002:247; Sekaran 2003:256; Leedy and Ormrod 2005:99,100; Kelly 2006a:287; Cohen, Manion and Morrison 2007:141). Further, triangulation seeks convergence of results; informs other methods and provides a better understanding of concepts being explored while increasing the researchers’ confidence (Creswell 1994:174-177; 2003:15-16; Sekaran 2003:256; Leedy and Ormrod 2005:99; Kelly 2006a:287; Cohen, Manion and Morrison 2007:141-142). In addition, triangulation helps the researcher to confirm results obtained through using different methodologies or sources of data (Patton 2002); ensures “goodness of data” (Sekaran 2003:256); allows in-depth understanding of phenomena (Denzin and Lincoln 2005b:5); enables researchers to “think outside the box”; and offers innovative options for addressing research questions (Brannen 2008:55,56; Teddlie and Tashakkori 2009:7). Furthermore, triangulation of investigators helps to reduce bias (Denzin 2009:312); while triangulation of methods provides complementary data and helps to establish the limitations of data obtained from particular methods (Hammersley 2008:32).

Nevertheless, triangulation has some shortcomings including: difficulties in replication and in aligning methods to the right question (Jick 1979:609); triangulation is costly in terms of time and resources (Kelly 2006a:287; Denzin 2009:312); and “triangulation is not an end in itself,” and hence needs to be carried out appropriately in analysing a research problem to ensure results obtained are valuable (Duffy 1987:133; Jick 1979:610). Blaikie (1991) contended that it was not appropriate to combine methodologies in social science studies because results from different methods answering the same question could not be treated in the same manner; Thurmond (2001:257) emphasised the need for the researchers to articulate or justify why triangulation was used and the benefits of the strategy to the study; and Kelly (2006a:287) considered triangulation to be inappropriate for small research projects. Hammersley (2008:22-23) further pointed out that some researchers used triangulation as a validity technique

The present study adopted “multiple triangulation” (Denzin 2009:310), based on the views and contributions of various authors (Jick 1979; Cohen, Manion and Morrison 2007:142-144; Brannen 2008:57-62; Creswell, Plano Clark and Garrett 2008:66); Denzin 2009:301-312; Hesse-Biber 2010:12) and triangulated paradigms, perspectives, theories, methodologies, investigators, data collection and analysis methods and interpretation. More specifically, the present study triangulated the Social constructivist (combined with Interpretivism and Naturalistic inquiry) and Participatory paradigms (see **section 3.1.2.3**) and perspectives; multiple methodologies including qualitative, quantitative, participatory and Sense-Making methodologies (see **section 5.1.5**); a mix of perspectives, theories, models and frameworks comprising the Systems, Soft systems and the Knowledge and information systems perspectives; the Sense-making theory, Social cognitive theory, Social capital concept, Knowledge management theory; CoPs; Wilson’s and Meyers’ models; and the Cynefin framework (see **section 3.2**). This study also triangulated probability (cluster) and non probability (purposive and snowball) sampling methods (see **section 5.4.2.4**); data collection methods (see **section 5.5**); and data analysis methods (see **section 5.7**). Finally, the present study used triangulation to achieve validity (see **section 5.8**).

This strategy was considered appropriate for researching the complex multidisciplinary study on AKIS, which investigated the role of local agricultural knowledge and external information among small-scale farmers (and groups) in Kirinyaga district, Kenya, identified the information behaviour of small-scale farmers, sources of agricultural information and knowledge, linkages and flows of knowledge and information and communication channels used. The study also assessed the usage of agricultural knowledge and information for improved understanding, decision making, problem solving and innovation, and identified knowledge management and information management practices.

### **5.3 Research design**

The choice of research methodology has implications for the research design especially for sampling, data collection and analysis (Durrheim 2006:47). Yin (1989:28) defined a research design as a “logical sequence that connects the empirical data to a study’s initial research question and, ultimately, to its conclusions” or an action plan for moving from the research questions, to data collection, analysis, interpretation and ultimately to the solutions to the problems. Sekaran (2003:117,118) and Kothari (2004:31), shared Yin’s (1989) view point and added that a research design offers several critical decision making options on how data can be efficiently collected and analysed to reach a solution while focusing on the research purpose.

A research design provides answers to the research questions and helps to control variance (Dwivedi 1997:39). There is, however, no clear cut definition of what a research design is and authors have described a research design as an activity, a framework or structure, a work plan and a blueprint. Cooper and Schindler (2003:146) maintain that a research design is an activity that determines a time-based plan founded on the research questions, and the selection of sources and types of information. They posited that a research design provides a framework for specifying relationships among variables and outlines procedures for different research activities such as sampling. Using different terminology, Kothari (2004:31) described a research design as the “conceptual structure within which research is conducted,” while Babbie (2004:86) and Sapsford and Jupp (2006:2) argued that the process of designing a research design specifies who or what is to be studied, when they should be studied, what methods should be used and for what purpose. Adding on to the debate, Durrheim (2006:34,57) viewed a research design as a plan of action that steers the manner in which data is collected and analysed. However, Yin (1989:29) argued that the research design is more than a “work plan” and argued that it addresses a “logical problem” that ensures evidence is linked to the research question(s).

Other authors have referred to a research design as a ‘blueprint’ for the collection, measurement and analysis of data (Frankfort-Nachmias and Nachmias 1996:99; Cooper and Schindler 2003:81,146; Kothari 2004:31), or as an “architectural blueprint” (Babbie and Mouton 2001:74). In describing a research design, Durrheim (2006:35,36) stated that it is a “strategic framework, a plan that guides research activity to ensure that sound conclusions are reached.” Durrheim (2006) contended that the term “architectural blueprint” was misleading and argued that the term implied being guided by technical standards and specifications set *a priori* of execution. Indeed as stated by Lewis (2003:49) “it is important to keep the design under review as the study progresses and to allow theory and data collection to inform each other.”

Research implementation is viewed as an iterative process requiring flexibility, fluidity and openness to change, implying that the research design could be changed during execution in order to fulfil the purpose of the research within available resources (Durrheim 2006:35). Although Babbie (2004:107) rightly observed that the research design should be done at the beginning of the study, Durrheim (2006:37) was quick to point out that in order to attain valid conclusions a researcher should reflect on the research process on a continuous basis and keep refining the process. In summarising the characteristics of a good research design, authors have stressed the need to have a flexible design (Patton 2002:255; Kothari 2004:31), which is “appropriate, efficient and economical” Kothari (2004:31).

Many authors are in agreement that the best research design is determined by the purpose of the study (Bell (1987; Patton 2002:253; Lewis 2003:49; Durrheim 2006:37,40; Cohen, Manion and Morrison 2007:78). Emphasising this point, Cohen, Manion and Morrison (2007:78) asserted that the design should be guided by the idea of “fitness for purpose.” According to Lewis (2003:49) and Cohen, Manion and Morrison (2007:78), the bottom line in identifying the best design is the research question(s) and how best these questions can be answered. Further, Durrheim (2006:37,40) made the point that a research design should not only be guided by the research purpose, but also by the theoretical paradigm informing the research, the situation within which the research is being carried out and the data collection and analysis techniques.

The research design of the present study was based on Durrheim’s (2006:37,40) definition of research design. In deciding on a research design, the present study applied Easterby-Smith, Thorpe and Lowe’s (1991:33-40) five factors to be considered in the choice of research design namely i) the involvement of the researcher – which is determined by the researcher’s choice of paradigm; ii) sampling – whether to sample a large population or focus on a small sample over a period of time (choosing between cross-sectional and longitudinal design); iii) determining whether theory comes first or data comes first and iv) experimental designs or field work methods. As pointed out by Wilson (2006b:667), the study of information is multi-disciplinary and calls for the use of social research methods that focus on behavioural and organisational “contexts” of information seeking from the perspective of the paradigm of social science.

As illustrated in **Appendix 3**, the present study adopted a cross-sectional study (Frankfort-Nachmias and Nachmias 1996:129; Sekaran 2003:135; Johnson and Christensen 2008:373). Basic and action research was carried out to explore, describe and explain (see **section 3.1.1**) various variables on agricultural knowledge and information systems among small-scale farmers focusing on their information behaviour, sources of local knowledge and external information, linkages and flows of knowledge and information between stakeholders and channels of communication and usage of knowledge and information. The study also determined the current practices in managing local agricultural knowledge and external information among farmers’ groups. To attain results on these broad areas, the researcher adopted a multi-method research design. The research design of the present study was based on the Social constructivism, (including Interpretive and Naturalist) and Participatory paradigms (see **section 3.1.2**); Soft systems, knowledge systems and knowledge management theory and CoPs perspectives, multiple methodologies (Mixed methods research to study information seeking, information needs, users and AKIS; Sense-Making methodology to study information behaviour, linkages and the sharing and exchange of information; Soft systems methodology to identify actors and potential actors, identify opportunities to improve a knowledge and information system, create awareness among relevant stakeholders and to link the different

activities by diverse agricultural actors into a purposeful whole; and Participatory) (see **section 5.1**); Systems approach, Soft systems, Knowledge systems and Knowledge and information systems perspectives, and CoPs; the Sense-making theory and social cognitive theory; Wilson's and Meyers' models as well as the Cynefin framework (see **section 3.2**).

In brief, the present study conducted fieldwork and studied small-scale farmers and farmers' groups and other agricultural actors in their social settings. The study population was small-scale farmers in Kirinyaga district (individuals and groups), individual farmers and key informants<sup>53</sup> or opinion leaders<sup>54</sup>, as well as information providers. Such people have insights that could prove particularly useful in helping a researcher understand what is happening and why. Emphasising the role of key informants, Patton (2002:321) observed that "one of the mainstays of much fieldwork is the use of key informants as sources of information about what the observer has not or cannot experience, as well as sources of explanation for events the observer has actually witnessed."

To gather data, the study used a mix of qualitative, quantitative and participatory techniques. The participatory techniques used were action research (RAAKS) (see **section 5.5.1.1**), and PRA (see **section 5.5.1.2**). The quantitative data was collected through questionnaires and interviews, while qualitative data was gathered using surveys (see **section 5.5.1.3**) through questionnaires and interviews using the Sense-making interviewing technique – (individual, key informant and focus group), observation (see **section 5.5.1.4**) as well as analysis of secondary data (see **section 5.5.1.5**). Cluster sampling was used to draw the sample of farmers' groups and farmers belonging to farmers' groups (see **section 5.4.2.4.1**). This process was guided by predefined criteria and the basis of the clusters was sub-locations. Snowball sampling was used to draw the sample of farmers who did not belong to a farmers' group (see **5.4.2.4.2**), key informants were identified purposively (see **section 5.4.2.4.3**), while the selection of information providers was based on the available information providers in the district.

To establish the role of farmers' groups, the present study compared the information behaviour of farmers who belonged to a farmers' group with those who did not belong to a farmers' group, where the latter acted as the control group. These comparisons facilitated the understanding of the role of farmers' groups in an AKIS. The study also compared information needs and seeking behaviours of men, women and the youth, as well as needs and behaviours of farmers belonging to different agricultural enterprises. It was important to understand their information behaviour because not

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<sup>53</sup> Key informants are considered to be experts in a given area because of their professional knowledge (Patton (2002:321).

<sup>54</sup> Opinion leaders are those individuals who have the ability to influence others peoples' behaviour in a desired way, and are often sought information or advice on areas where other people consider them to be experts. Opinion leaders are also referred to as gatekeepers, influencers, fashion leaders and information leaders (Rogers and Shoemaker 1971:199).

enough is known to resolve some of the key problems of rural small-scale farmers. Thus, studying the information behaviour of this target group provided knowledge to resolve farmers' problems.

## **5.4 Study population and sampling**

This section describes the study population and sample, and outlines the sampling strategy, sampling frame, sample size and sampling techniques used.

### **5.4.1 Population**

The term population refers to the total group of things, events or people who a researcher wants to investigate or is interested in (Peil and Rimmer 1995:23; Frankfort-Nachmias and Nachmias 1996:179; Sekaran 2003:265; Kothari 2004:55; Gravetter and Forzano 2009:107-128). Babbie and Mouton (2001:100) defined a population as the group on which the researcher draws conclusions. Mugenda and Mugenda (2003:9,10) referred to population as the sum or whole group of individuals, objects or events that match a given specification. For these two authors, an "accessible population" is the manageable population with the relevant characteristics from which the sample is drawn. On the other hand, Babbie (2004:190) defined a study population as the sum of elements from which the sample is selected. Most of the farmers in Kirinyaga district are small-scale farmers and there are many formal and non-formal farmer groups operating under schemes, projects, FFS, associations, committees, and interest groups. In the case of the present investigation, the study population was small-scale farmers and small-scale farmers' groups in Kenya, along with other agricultural actors working with farmers in Kirinyaga district.

There are many descriptions for the term "unit of analysis." Frankfort-Nachmias and Nachmias (1996:53) described a unit of analysis as "the most elementary part of the phenomenon to be studied." On the other hand, Babbie and Mouton (2001:84) described it as the object, phenomenon, entity, event or processes that the researcher is studying, while Easterby-Smith, Thorpe and Lowe (2002:44) argued it is "the entity that forms the basis of any sample." Put differently, Mugenda and Mugenda (2003:14) described units of analysis as "those units that we initially describe for the purpose of aggregating the characteristics in order to describe some large group or abstract phenomena ... about which or whom descriptive or explanatory statements are to be made." Sekaran (2003:132,133) focused on the data analysis angle and suggested that a unit of analysis refers to the level at which data are aggregated for analysis. Sekaran (2003) posited that the unit of analysis guides the data collection methods, sample size and variables studied, while Babbie (2004:94,95) argued that a unit of analysis is "the what or whom being studied."

The units of analysis may comprise individuals, groups, organisations and institutions or cultures (Frankfort-Nachmias and Nachmias 1996:53; Easterby-Smith, Thorpe and Lowe 2002:44; Durrheim



2006:41). Some authors have argued that each study be conceived around a single unit of analysis (Easterby-Smith, Thorpe and Lowe 2002:44), while others support the use of multiple units of analysis (Patton 2002:228; Durrheim 2006:41). Units of analysis have an impact on sample selection, data collection and interpretation, hence where more than one unit of analysis is used, each unit of analysis requires different kinds of data collection, analysis and conclusions (Patton 2002:228). The present study adopted different units of analysis comprising individuals (as individuals, members of groups and representatives of organisations) and farmers' groups (Durrheim 2006:41). In the case of individuals, the unit of attention was the "person in situation" (Dervin 1998:40). The specific units of analysis studied were individual small-scale farmers, agricultural actors such as researchers, extensionists and educationists, traders and stockists and other information providers (studied as representatives of organisations), as well as small-scale farmers' groups.

Patton (2002:228) defined a unit of observation as the "subject, object, item or entity from which we measure the characteristic or obtain the data required in the research study." Selected respondents from these units of observation in the target population provided the information and data required for analysis. The units of observation of this study comprised (i) small-scale farmers - individuals members that belonged to farmers' groups (formal and informal) in Kirinyaga district, Kenya; (ii) farmers' groups, (iii) individual small-scale farmers that did not belong to farmers' groups, (iv) information providers – researchers, extensionists, stockists, traders, NGOs, CBOs and the private sector organisations among others and (v) key informants – gatekeepers and opinion leaders, chiefs, community leaders, project leaders, farmers' associations, Ministry of Agriculture, Ministry of Social Services in Kirinyaga district. This district has four divisions namely Ndia, Central, Gichugu and Mwea (see **section 2.3**), and the divisions are divided into 21 locations, which are further sub-divided into 80 sub-locations (Republic of Kenya. Ministry of Finance and Planning 2002a:4).

#### **5.4.2 Sampling**

A sample design is a plan for obtaining a sample from the population and refers to the technique(s) or procedure(s) adopted in selecting items for the sample (Kothari 2004:55). A sampling design requires knowledge of sampling theory along with practical knowledge of what is possible and economic (Hedges 2004:64). Peil and Rimmer (1995:23,41) defined sampling as "the selection of a part to represent the whole" and the logic behind sampling is to avoid bias. A sample is a part of a whole (Rao 2005:263) or smaller sub-group, elements or representation with the relevant characteristics that are selected from the target population to represent the whole population (Peil and Rimmer 1995:23; Hedges 2004:64; Sapsford and Jupp 2006:26; Gravetter and Forzano 2009:128-129). Sampling was also described as the art of selecting research participants from the entire population (Durrheim (2006:49). It is the action of choosing cases to observe (Durrheim and Painter 2006:132).

Sampling saves time, cost and effort, increases accuracy of results, provides accessibility as well as reliability and ensures consistent and unbiased estimates of the population (Sekaran 2003:267; Cohen, Manion and Morrison 2007:100). A study sample needs to be representative of the population in order to facilitate generalisation (Lewin 2005:217; Gravetter and Forzano 2009:130). The elements selected should be “those to whom the research question applies” (Wassenaar 2006:71), and are capable of providing information that is relevant, comprehensive and rich (Lewis 2003:49). As stressed by Cohen, Manion and Morrison (2007:211), sampling is a critical feature of the survey approach, and the aim of a sample is to obtain maximum information about a population with minimum effort (Rao 2005:263).

#### **5.4.2.1 Sampling strategies**

Patton (2002:247) observed that a study may use several sampling strategies and include several types of data. The strategy chosen is determined by the criterion of suitability or the “fitness for purpose” (Cohen, Manion and Morrison 2007:117). Sampling may be probability or non-probability, also referred to as random and non-random sampling (Frankfort-Nachmias and Nachmias 1996:183; Cooper and Schindler 2003:183; Leedy and Ormrod 2005:199; Lewin 2005:217; Durrheim and Painter 2006:134,139; Gravetter and Forzano 2009:133).

A random sample is based on the laws of probability (Peil and Rimmer 1995:24), and is a sample in which the chance of selecting each individual or group in the population is equal (Creswell 2003:156,164; Kothari 2004:60; Leedy and Ormrod 2005:199). A probability sample aims to reduce bias hence, is perceived to be the most rigorous sampling approach (Ritchie, Lewis and Elam 2003:78). Indeed proponents of probability sampling such as Beins (2004:100) described probability sampling as “the gold standard of sampling.” Other advantages of probability sampling are: it yields samples that are truly representative of the population (Sheppard 2004:96; Leedy and Ormrod 2005:199; Neuman 2006:227; Cohen, Manion and Morrison 2007:110), and enables the researcher to make generalisations about the population (Durrheim and Painter 2006:139; Cohen, Manion and Morrison 2007:110). There are several probability sampling techniques including simple random sampling; systematic random sampling; stratified random sampling (proportionate and disproportionate); cluster sampling (Cooper and Schindler 2003:199; Mugenda and Mugenda 2003; Kothari 2004:61-67; Durrheim and Painter 2006:134-139; Cohen, Manion and Morrison 2007:110); area sampling (Frankfort-Nachmias and Nachmias 1996:190; Sekaran 2003:275; Kothari 2004:16,65); double sampling (Cooper and Schindler 2003:198; Sekaran 2003:173-174); stage and multi-phase sampling (Sekaran 2003:175; Cohen, Manion and Morrison 2007:110).

Cooper and Schindler (2003:212) pointed out that social scientists often use non-probability methods because they are economical and convenient in some circumstances. Non-probability sampling

facilitates a researcher's targeting of a specific group, especially in the case of small-scale research. Non-probability methods have several advantages. They are simple to set up, are cost effective and can provide adequate results where the researcher does not seek generalisations (Cohen, Manion and Morrison 2007:112). However, these sampling methods have their low points. Samples emanating from non-probability methods do not have a basis for estimating the chance of each item in the population being included in the sample (Shaughnessy, Zechmeister and Zechmeister 2003:131; Kothari 2004:59); the method is liable to distortion (Hedges 2004:64); may represent a sub-group as opposed to the wider population (Cohen, Manion and Morrison 2007:110); and the methods are selective in nature, which makes them biased and not representative of the wider population (Cohen, Manion and Morrison 2007:112).

Non-probability sampling techniques include convenience, quota and purposive sampling (Peil and Rimmer 1995:25; Leedy and Ormrod 2005:206; Cohen, Manion and Morrison 2007:113; Creswell 2007:125) as well as dimensional and snowball sampling (Cohen, Manion and Morrison 2007:113). As pointed out by Creswell and Plano Clark (2007), there is a need to consider the implications of samples collected using different sampling methods and of varying sizes when merging and interpreting qualitative and quantitative data. Teddlie and Tashakkori (2009:178-180) further pointed out that a multiple methods research study needs to identify a sample that can provide answers to the research questions hence probability and non probability sampling strategies may need to be creatively combined. To overcome the challenge, highlighted by (Creswell and Plano Clark 2007), the present study used large sample sizes. In studying the AKIS of small-scale farmers in Kirinyaga district, this investigation adopted both probability and non-probability methods to identify samples from the different units of analysis to address different research questions. Specifically, the study used i) cluster sampling (see **section 5.4.2.4.1**), ii) snowball sampling (see **section 5.4.2.4.2**), and iii) purposive sampling (see **section 5.4.2.4.3**).

#### **5.4.2.2 Sampling frame**

A sampling frame was defined as a complete list, directory or index of cases from which a sample can be selected (Cooper and Schindler 2003:188; Lewin 2005:217; Durrheim and Painter 2006:133). A sampling frame provides access to the individual elements of the population under study via sampling units or directly, and exhausts the total population. These lists may contain mistakes but may be the only way of finding the sample elements to be studied.

In the case of the present study, there was no sample frame of farmers groups in Kirinyaga district and different organisations or projects had incomplete lists of farmers' groups. For example the lists maintained by KENFAP, KESSFA and other groups including projects and interest groups were not comprehensive and most did not include non-formal groups. The records obtained from the database

of the Ministry of Social Services in Kirinyaga district focused on registered development groups and were not classified under farmers' groups. Besides, the list did not include informal farmers' groups (the majority). Furthermore, Kirinyaga district had diverse agroecological variations, farming systems and infrastructure conditions. These variations were likely to yield different small-scale farmers' AKISs with different needs and opportunities. Understanding this diversity would guide the researcher on strategies for increasing uptake of new improved technologies and agricultural production in Kirinyaga district. In this regard, the researcher worked closely with the administration in the district at various levels (District agricultural officer (DAO) and other key informants from the divisions, locations and sub-locations) and compiled a list of farmers' groups that fitted the criteria used by Rees *et al.* (2000) that is detailed below in **section 5.4.2.4.1**. The sampling frame included clusters from both rural and peri-urban areas.

#### **5.4.2.3 Sample size**

Authors have argued that there are no clear cut rules for sample size in qualitative research, hence it is difficult to arrive at an accurate sample size (Patton 2002:244; Durrheim 2006:34,49; Wilson and Abeyasekera 2006:26; Gravetter and Forzano 2009:133). These authors suggested a number of factors for determining sample size including what the researcher wants to know, the purpose of the inquiry, the nature of the population, what will be useful, what will have credibility, the kind of analysis to be performed, how the findings will be used, practical constraints such as the number of people the researcher has access to, time and resources available, as well as breadth and depth tradeoffs. Others have argued that multi-purpose surveys for example, call for the researcher's judgement as opposed to calculation (Wilson and Abeyasekera 2006:26). Hedges (2004:67) argued that a large sample size leads to a greater reliability (Kothari 2004:155; Cohen, Manion and Morrison 2007:101). As the purpose of the present study was to explore phenomena and to understand diversity, a large sample was selected.

#### **5.4.2.4 Selecting sampling techniques**

As mentioned above, both probability and non-probability sampling strategies were used for selecting samples from the different units of analysis and observation. According to Durrheim (2006:50), a researcher "must justify why a particular sampling strategy suits the particular research study." The specific sampling techniques used include i) cluster sampling for selecting small-scale farmers who belonged to a farmers' group, ii) snowball sampling to select small-scale farmers who did not belong to a farmers' group, and iii) purposive sampling to select other agricultural actors including information providers and key informants. As pointed out by Kemper, Stringfield and Teddlie (2003:273,284), complex mixed methods research often required multiple sampling techniques comprising probability and non probability. Gravetter and Forzano (2009:150) further noted that

combining sampling methods in selecting participants improved the representativeness of a sample. The justification for choosing each of these sampling techniques used is discussed below.

#### **5.4.2.4.1 Cluster sampling**

Cluster sampling is used where a comprehensive sampling frame cannot be obtained and the population is large and scattered (Peil and Rimmer 1995:33; Hair, Bush and Ortinau 2003:357; Kothari 2004:16; Lewin 2005:217; Durrheim and Painter 2006:138; Sapsford and Jupp 2006:36; Hesse-Biber 2010:50; Rubin, Rubin and Haridakis 2010:202). Much as these authors laid emphasis on large populations, Cohen, Manion and Morrison (2007:112) pointed out that “cluster samples are widely used in small-scale research.” Elsewhere, Kemper, Stringfield and Teddlie (2003:279) noted that cluster sampling was suitable for groups that occur naturally in the population, such as farmers’ groups in rural areas in the case of the present study. The pointers to small-scale research and appropriate of the sampling technique for groups provided justification for using cluster sampling in the present study. Cluster sampling is generally considered as a probability sampling method (Beins 2004:102; Kothari 2004:16,65; Leedy and Ormrod 2005:203; Rao 2005:268; Sapsford and Jupp 2006:36; Johnson and Christensen 2008:235). However, Sapsford and Jupp (2006:36) contended that cluster sampling is non-probability at all levels, except in instances where there is treatment and a control group and where at least one element of randomisation is preserved. In Beins’s (2004:102) opinion, despite the fact that selection of clusters is non-systematic, the sub-clusters are equally non-systematic, implying that the population is not biased and is random. Likewise, McBurney and White (2004:249,253-254) concurred with Beins (2004:102) and argued that although the population defined for the study purposes may be different from the actual population, and may not be as accurate as random sampling, it is considered to be fairly accurate.

Cluster sampling can be proportionate or disproportionate (Durrheim and Painter 2006:139; Sapsford and Jupp 2006:35). Clusters may comprise geographical clusters within a known locality and various authors have referred to geographical subdivision sampling method as area sampling (Cooper and Schindler 2003:196; Hair, Bush and Ortinau 2003:357; Kothari 2004:16,65), making area sampling a variant of cluster sampling. The cluster sampling steps include identifying the population and dividing the population into smaller non-overlapping heterogeneous subdivisions (clusters) (Welman, Kruger and Mitchell 2005:65; Cohen, Manion and Morrison 2007:112). Clustering may be at various levels or phases – either by random selection or additional clustering (Durrheim and Painter 2006:139; Sapsford and Jupp 2006:35; Johnson and Christensen 2008:236) and the clusters are externally homogenous but internally heterogeneous. According to Neuman (2006:234), the sample becomes better where there are more clusters, because the population elements tend to be different. This view point was shared by Cohen, Manion and Morrison (2001; 2007:112), who recommended the selection of many clusters followed by light sampling within each cluster to avoid bias. They

advocated for further stratification within the cluster sample. For example, Bellon (2001:22) stressed the importance of taking gender issues into consideration.

Cluster sampling has many advantages. This sampling technique confines the field work to specific sites, thus enabling the researcher to enjoy economic advantages in terms of costs and time. The technique is also considered more convenient (De Vos 1998:197; Sekaran 2003:274; Neuman 2006:234; Gravetter and Forzano 2009:139). Additional advantages cited by the above authors include the usefulness of the method where a sampling frame listing the population is not available or is not accurate; or where the distance separating the elements (geographical / time) is large; the method is fast and easy; and measurements of individuals can be taken from groups.

Critics of cluster sampling have argued that this sampling method is biased when compared to pure random sampling (Peil and Rimmer 1995:34). Other authors maintain that the degree of generalisation depends on the extent to which the clusters within the population are similar, making it necessary to comment on the general application of results (Neuman 2006:234; Cohen, Manion and Morrison 2001; 2007:112). Furthermore, Sekaran (2003:274) and Hair, Bush and Ortinau (2003:357) argued that elements in the naturally occurring groups tend to be homogenous and do not have much heterogeneity among them. Cluster sampling exhibits greater bias and sampling error at each sampling stage, which lowers precision and confidence in results (Sekaran 2003:274; Kothari (2004:65; Sapsford and Jupp 2006:34,36). Further, Sapsford and Jupp (2006:36) argued that clusters may fall on the wrong population by chance. According to Neuman (2006:234), there are trade-offs between accuracy and cost-saving in this sampling technique.

Despite the above limitations, the present study adopted multistage cluster sampling (specifically area sampling) to identify small-scale farmers' groups and farmers because of the advantages cited above, and more so because there was no comprehensive sampling frame of small-scale farmers and farmers' groups in Kirinyaga district. Besides, cluster sampling was one of the data collection methods suggested for mixed methods or multi method research (Kemper, Stringfield and Teddlie 2003:279; Johnson and Christensen 2008:452). Clustering was carried out in phases and the elements in the sub-clusters were stratified by gender and farming enterprise. A sample was then drawn from the clusters to constitute the randomly selected sample (Sapsford and Jupp 2006:65-67; Cohen, Manion and Morrison 2007:112). The basis of the clusters was sub-locations. The selection of farmers' groups was guided by the criteria used by Rees *et al.* (2000) – have (i) a concentration and diversity of agricultural developments; (ii) diversity and concentration of actors; (iii) social organisation of farming groups; agro-ecological representation. The criteria will in addition include – (iv) balanced representation of men, women and youth farmers and (v) the criterion for selecting the youth was based on being between 15 to 25 years of age, which were added by the researcher.

The researcher worked closely with the administration in Kirinyaga district at various levels to draw up a list of clusters of farmers' groups that fit the above criteria in each division. The researcher first selected clusters, from which a smaller number of clusters were selected using random sampling based on the above criteria, followed by stratification of the individuals by gender. The sampling steps included (i) selection of three locations from each of the four divisions in Kirinyaga district (12) (see **section 2.3.1**); (ii) selection of three sub-locations from each location (36); (iii) selection of three farmers' groups from each sub-location giving a total of 108 farmers' groups; (iv) one farmer was then selected from each farmers' group (preferably representing gender) giving a total of 108 individual farmer respondents. However, 90 farmers' groups and 102 individual farmers belonging to a group were ultimately interviewed.

#### **5.4.2.4.2 Snowball sampling**

Patton (2002:237) described snowball or chain sampling as a non probability approach for locating information-rich key informants or critical cases. Snowball sampling, also called referral sampling (Hair, Bush and Ortinau 2003:362), accidental sampling (Powell and Connaway 2004:95), or network or nominated sampling is largely used in exploratory qualitative research, especially where access is difficult to identify the informants or participants (Polit and Beck 2004:292,306). Snowball sampling is a non-probability strategy that identifies participants subjectively based on specified criteria to assist with the initial identification of participants (Hair, Bush and Ortinau 2003:362). The participants with particular characteristics then identify other prospective participants who match the set characteristics (Ritchie, Lewis and Elam 2003:94; Lewin 2005:219). In other words, the initial small group identified acts as contacts (Durrheim and Painter 2006:139) or informants that identify other people with similar characteristics (Cooper and Schindler 2003:203; Bryman 2004:100; Lewin 2005:219; Sapsford and Jupp 2006:69; Johnson and Christensen 2008:239).

Critics of snowball sampling have argued that it is time consuming, and that the sample generated is not representative of the wider population (Ritchie, Lewis and Elam 2003:94; Bryman 2004:102); does not reach a large sample because of restrictions of acquaintances in the network, and the quality of responses depend on convenience and the willingness and cooperation of the person referring the researcher to the participants; and introduces bias and findings cannot be generalised (Hair, Bush and Ortinau 2003:363). Nevertheless, snowball sampling serves as a supplement to other methods (Ritchie, Lewis and Elam 2003:94). It is simple to set up, cost effective, provides access to people who are otherwise difficult to reach, and can provide adequate results where generalisation is not the aim of the study (Polit 2004:306; Cohen, Manion and Morrison 2007:112).

Based on these advantages, snowball sampling was used in the present study to identify small-scale

farmers who were not members of a farmers' group. The chairpersons of farmers' groups (selected through cluster sampling) were asked to identify farmers not belonging to a group around their locality, who then identified another farmer not belonging to a group. In sum, two farmers in each sub-location (36 in total) were invited to participate in the individual interviews of farmers not belonging to a group by the group chairpersons, and each was asked to identify another farmer not belonging to a group in their locality, preferably of the opposite gender, making a total of 144 (2 participants identified by chairpersons x 36 sub-locations x 2 farmers identified by farmers not belonging to a group=144). Although 144 farmers not belonging to a group were invited for an individual interview, only 71 turned up for the study. This group acted as a control and provided a basis for comparison with farmers who belonged to farmers' groups. This comparison assisted the researcher to assess the benefits of farmers' groups.

#### **5.4.2.4.3 Purposive sampling**

Purposive sampling, or judgement sampling (Hair, Bush and Ortinau 2003:361; Johnson and Christensen 2008:239) is a non probability sampling technique that is often used in qualitative research, based on the researcher's knowledge of the population and the study objectives (Powell and Connaway 2004:95). This sampling technique is often used to access individuals with a wide knowledge about particular issues (Kemper, Stringfield and Teddlie 2003:279; Sheppard 2004:94; Cohen, Manion and Morrison 2007:114). In purposive sampling, the researcher hand picks cases that fit the criteria, special situation or purpose being sought by the researcher (the researcher sets the criteria for selection) (Peil and Rimmer 1995:27; Sekaran 2003:177; Beins 2004:105; Sheppard 2004:94; Rao 2005:266; Neuman 2006:222; Creswell 2007:126). Purposive sampling helps the researcher to maximise on the overall perspective and maximise variations in the community at the beginning of the study (Creswell 2007:126). Among the merits of probability sampling include the selection of a better sample based on the judgement of the researcher or expert, and the convenience of the method. However, purposive sampling is not representative of the population, hence the method is mainly used to provide initial insights (Hair, Bush and Ortinau 2003:361). Ritchie, Lewis and Elam (2003:78) stressed the need for objectivity in choosing participants. Besides, findings from purposive sampling have limited generalisability (Johnson and Christensen 2008:239).

Purposive sampling was used in the present study to identify key informants and these were selected with guidance from the office of the DAO and from project leaders operating in Kirinyaga district. Selection of information providers was based on the available information providers in the district and was guided by discussions with the DAO's office, key informants, agricultural institutions and other development partners operating in the district. In sum, a sample size of four key informants, eight NGOs, CBOs, projects and religious organisations, four information providers, 27 input



stockists and 13 government of Kenya organisations, research, education and training institutions was identified.

### **5.5 Data collection methods (primary and secondary)**

Wilson (1981a) made the point that the choice of research method is related to “the overall 'paradigm' a researcher chooses.” Methods are “approaches used in ... research to gather data which are to be used as a basis for inference and interpretation, for explanation and prediction” (Stewart 1984:12). Elsewhere, Cornwall, Guijt and Welbourne (1994:98) described methods as the “nuts and bolts, or mechanics, of data collection and information exchange.” The construct research method refers to the methods or techniques used by the researcher during the process of carrying out a study, including techniques concerned with the gathering of data, analysis of data (Creswell 2003:5), and evaluation of the accuracy of the results (Kothari (2004:7-8). Data collected may be primary or secondary, and the two sources are complementary and may be combined, such as by including the findings of several empirical studies to reach conclusions that may not be suggested by a single source (Stewart 1984:12). Mixed data collection methods may be intra method where data from the same method are combined or intermethod where data from multiple methods are combined either sequentially or concurrently (Johnson and Turner 2003:298). The present study adopted a multiple research design and collected qualitative and quantitative data concurrently. The data was collected using primary (see **section 5.5.1**) and secondary data collection methods (see **section 5.5.2**). Triangulation of methods was considered an important aspect for a complex, multifaceted and multidisciplinary study of AKIS, and provided the researcher with practical alternatives where a particular method or tool failed to work in a particular community.

In keeping with research ethics, the researcher needed permission to collect data from the government authorities, institutions and the consent of participants of the study at various levels at different sites (Creswell and Plano Clark 2007:113) (see **section 5.9** and definition of key terms in the preliminary pages ). Access to the field was attained through the District commissioner and the DAO. A letter of introduction was obtained from the UKZN (South Africa) to the Ministry of Education, Science and Technology (Kenya) (see **Appendix 4**). The researcher also sent a letter of introduction to the respective ministries and institutions to introduce the study and request their consent and participation in the study (see **Appendix 5**). The Ministry of Education, Science and Technology provided a letter of authorisation that was to the Kirinyaga district commissioner (DC) and other relevant authorities and institutions at various levels in the district, allowing the research to be carried out (see **Appendix 6**), and a permit to conduct research (see **Appendix 7**). A preliminary visit was made to the field in June 2008, to introduce the research and establish contact with key people who provided guidance and logistical support during data collection, and to carry out sampling. An

earlier visit was made to Thika district, Juja location, Kalimoni division to pre-test and revise the data collection tools (see **Appendix 8**).

### **5.5.1 Primary data collection methods**

Cohen, Manion and Morrison (2007:193) described primary data sources as those that are original to the problem being investigated. Primary data are considered more valid, providing more light and being more truth-revealing than secondary data (Leedy and Ormrod 2005:89). Multiple research method design calls for the collection of data from mixed methods (Creswell 2007:110). Mixed methods provide “multiple sources of evidence” (Johnson and Christensen 2008:201). In this regard, the present study triangulated methods for sampling, data collection and analysis methods and combined formal and informal settings, as well as verbal and non-verbal sources (Frankfort-Nachmias and Nachmias 1996:205). As discussed in **section 5.2**, triangulation worked towards counteracting any bias inherent in any method, data source or analysis; sought convergence of results and provided a better understanding of concepts being explored (Creswell 1994:174-177). Furthermore, the triangulation of methods allowed in-depth understanding of phenomena (Denzin and Lincoln 2005b:5).

The present multiple research method study used a mixture of qualitative, quantitative and participatory data gathering methods. The decision on the specific methods to use was based on the most appropriate method for the research questions to be answered (Creswell and Plano Clark 2007:110; Johnson and Christensen 2008:201) and the strengths and weaknesses of the different methods (De Leeuw and Hox 2008:139). The qualitative methods (surveys, questionnaires and interviews - individual, key informant and focus group) that emphasise words (Denzin and Lincoln 2005b:3) have been used in information seeking and user studies by a number of authors (Mchombu 1992; 1993; Kaniki 1989) as well as in the study of AKIS (Rees *et al.* 2000; Garforth 2001a; Stefano *et al.* 2005a). On the other hand, the quantitative methods (surveys) that emphasise quantification in the collection and analysis of data (Bryman (2004:19) were used by Garforth (2001a). As asserted by Wilson (2006a:681), quantitative methods have a role to play in conducting information needs research. Participatory methods used in the study of AKIS were RAAKS and were used by various authors (Den Biggelaar and Mugo 1996; Salomon and Engel 1997a; Rees *et al.* 2000; Best *et al.* 2005; Stefano *et al.* 2005a; Moussa 2006); and PRA methods which were used by Garforth (2001a), Davis (2004), Best *et al.* (2005), and Stefano *et al.* (2009). As pointed out by various authors (Creswell and Plano Clark 2007:110,116; De Leeuw and Hox 2008:142), the process through which data is collected using qualitative and quantitative methods at the same time is referred to as concurrent data collection. Data for the present study was collected in two phases. In phase one, data was collected through survey, observation and PRA, while RAAKS and questionnaires followed in phase two.

#### **5.5.1.1 Relaxed Appraisal of Agricultural Knowledge Systems (RAAKS) methodology**

Methods used in PAR include collective research, recovery of history and production and dissemination of new knowledge through oral, written and visual forms (Cornwall, Guijt and Welbourn 1994:110), as well as RAAKS (Engel 1995; 1997; Salomon and Engel 1997a:23; Checkland 2000). Action research is a systematic participatory process that entails working in collaboration with the communities being studied (McNiff and Whitehead 2006:7,28), and producing practical ideas and knowledge that practitioners can implement to improve practice (Reason and Bradbury 2001:2; Herr and Anderson 2005:9; McNiff and Whitehead 2006:36), or transform practice (Herr and Anderson 2005:9). As earlier observed by Chambers (1998:xv), action research provides new ways and potentialities in which the disadvantaged play the role of researchers and analysts, hence can present their realities to those in power and influence policy. In so doing, PAR reinstates self-respect among oppressed people by focusing on the experiences of the poor and groups that were exploited (Cornwall, Guijt and Welbourn 1994:110). Indeed, there is common agreement that authors are not only interested in research but action towards the change process (Cronholm and Goldkuhl 2004:47). PAR, therefore, shares the power of knowledge generation with community members under the Interpretivist philosophy (Waring 2002:50). However, Bhana (2006:430,432) argued that PAR is rooted in the philosophical viewpoints of both Positivism and the Interpretivism, and the goal of PAR is to produce knowledge jointly with the participants affected by that knowledge, with the aim of ameliorating their social, educational and material circumstances.

Emphasising the merits of PAR, Röling and Pretty (1997) argued that participatory methods make new things visible, put farmers' knowledge to use and facilitate learning. Elsewhere, Pretty and Vodouhe (1997) pointed out that the participatory methods involving local people through diagramming and visual construction provided them an opportunity to participate in the creation and analysis of knowledge. Furthermore, visualisation increased the depth and intensity of discussion. Action research is thus considered radical and challenges the traditional approach to scientific research (Waring 2002:50). Drawing attention to another important aspect of PAR, Cronholm and Goldkuhl (2004:56-57) noted that this participatory method provides a balance between the science and practice interplay, and situates the research in a community context. Somekh (2006:27,31) further observed that action research generates knowledge that may be considered as "a trustworthy foundation for improvement," but pointed out that the values, traditions and the social setting of participants influence action research.

However, Pratt and Loizos (1992:9) cautioned that the researcher should ensure a balance between the technical reasons and the social reasons. In addition, the researcher should maintain control over the data gathering process. Some authors have argued that action research yields fuzzy understanding due to some definitions used in action research not being very clear (scientific rigor), which could lead to confusion or inconsistency among researchers. There are, however, benefits

between the change practice and the empirical research practice (Cronholm and Goldkuhl 2004:56-57), and a number of authors have used PAR and in particular RAAKS (Engel 1995; Kennedy 2001; Moussa 2006; Opondo *et al.* 2006).

According to Röling (2004:4), RAAKS is a methodology and not just a set of methods. RAAKS is a soft systems methodology application based on the soft knowledge systems perspective (Engel 1995; 1997; Salomon and Engel 1997a:23; Checkland 2000; Röling 2004:4). RAAKS is a multi-perspective method that overcomes weaknesses of earlier methods that were linear and one-sided. It offers many windows that guide stakeholders to recognise, organise and deliberate on key events and relevant issues that lead to a more comprehensive understanding of the inter-play of actors and the development of solutions where knowledge is understood in ways that enhance “innovative thinking” (Engel 1995; 1997; Salomon and Engel 1997a:23-24). In other words, RAAKS helps to raise awareness and understanding and to propose corrective action by guiding the researcher and participants through a joint-inquiry that defines useful interventions (Engel 1995). RAAKS methods and tools have proved useful to information providers (organisations and individuals), and to social actors by helping them deal with complex societal issues in agricultural development and other disciplines (Engel 1995). RAAKS also facilitates social and institutional learning processes that are necessary in incorporating the multiple rationalities of stakeholders such as farmers, researchers and policy makers in their ways of thinking (Engel 1995; 1997; Salomon and Engel 1997a:23-24), and provides for the inclusion of women and other frequently forgotten groups such as the youth (Salomon and Engel (1997b:21). Various authors (Den Biggelaar and Mugo 1996; Rees *et al.* 2000; Best *et al.* 2005; Stefano *et al.* 2005a) have successfully used RAAKS in the study of AKIS. The present study adopted RAAKS to guide the researcher in studying the AKIS of small-scale farmers in a rural agricultural community in Kirinyaga district. RAAKS helped the researcher to gain understanding of knowledge and information networks within which small-scale farmers were operating and facilitated the identification of opportunities to improve AKIS.

RAAKS has several windows, and each has several tools that address issues that fall under that specific window (Salomon and Engel 1997b:21). The present study adopted six RAAKS windows to gather and process information:

- *Actor analysis (A2 RAAKS)*: which helped the researcher to generate a list of actors relevant to the innovation process.
- *Prime mover septagram (RAAKS A5/B6)*: which helped the researcher to identify who the different actors perceived to be prime movers were, and to approximate the knowledge system and its performance.
- *Knowledge network analysis – information source (RAAKS B3a)*: which has three tools namely i) Information source-use exercise, ii) Communication network sheet, and iii) Source intermediary

user sheet. The knowledge network analysis helped to establish the key sources of knowledge and information that were used by farmers and to identify the types of knowledge and information that were necessary for successful performance of the AKIS.

- *Knowledge network analysis - communication sheet (RAAKS B3b)*: which guided the drawing of communication network diagrams. This tool further helped the research team to identify the intermediaries and media of communication used, as well as establish the effectiveness of existing communication networks in linking relevant sources of knowledge and information, intermediaries and users.
- *Integration analysis (RAAKS B4/a)*: which helped the researcher to explore the relative coalitions and networks, and establish linkages between actors. The analysis further helped to assess why linkages were established and how intensively the linkages between actors were. The types of linkages may be resource linkages, administrative and communicative linkages. The Linkage matrix (B4/a) tools summarise information on the existence, frequency and intensity of contacts between pairs of system actors.
- *Basic configuration diagram*: which included a synthesis of the results from interviews, questionnaires, PRA and RAAKS, and helped to provided overviews of the AKISs in the different divisions and the overall AKIS of Kirinyaga district.

#### **5.5.1.2 Participatory Rural Appraisal (PRA) methods**

(PRA grew out of RRA and the special importance of participation (Pratt and Loizos 1992:74; Cornwall, Guijt and Welbourn 1994:108; Kumar 2002:29). PRA (or participatory reflection and action) shifted leadership of the research to local community members, and the methods enable rural communities to “share, enhance and analyze their knowledge” on their lives and environment. Reflection on behaviour and attitudes are core activities of PRAs (Kumar (2002:42), and although these activities are difficult, PRAs have the potential to lead the transformation in behaviour and attitudes of communities or local people (Chambers 1998:xvi; Kumar, 2002:42). Community members thus plan, monitor and evaluate their own actions and control their lives while the researcher plays a catalytic role (Kumar 2002:31). As discussed in **section 3.1.2.3**, PRA approaches are mainly qualitative and interpretive (Holland and Blackburn 1998:1), and are generally used within the critical social science philosophical school of thought. PRA methods are contextual, and aim at gathering information about a particular location or situation in a rural setting and cause change that benefits the particular community (UKZN. School of Education, Training and Development 2004:45,62). In effect, PRAs offer an approach to sharing information in a creative manner (Cornwall, Guijt and Welbourn 1994:109).

PRAs have several advantages. They: i) enable researchers to see the other side of things and to focus on the perceived needs and priorities of small-scale farmers (Chambers 1994:264); ii) promote the

interaction of different stakeholders and ensure commitment to utilisation of results, pooling of diverse capacities, knowledge, ideas and expertise to the study (Narayan 1996:25); iii) help to understand current problems and lead to sustainability of community activities (Zhuge and Tisdell 1999:22); and iv) provide for the involvement of different local stakeholders who have drive and creativity (Pretty and Vodouhe 1997; Holland and Blackburn 1998:1). In addition, PRAs v) facilitate technology innovation and adoption (Röling and Pretty 1997); vi) recognise the complexity of the world (Pretty and Vodouhe 1997:51); vii) help to understand current problems and lead to sustainability of community activities (Zhuge and Tisdell 1999:22); viii) PRA methods are considered to be much faster and cost-effective than questionnaires because they deal with many people at the same time, and ix) the methods are lauded for their transformative effect on not only the community members, but the researcher as well (Kumar 2002:15,29-31). x) Finally PRA methods are useful in addressing issues pertaining to culture, power, exploitation and changing existing social inequalities among others (Heck 2004:164-165). Additional advantages of PRA were discussed in **section 5.1.4**).

Nevertheless, various PRA limitations have been advanced including: i) that visualisation is not neutral and there is a tendency for bias in translation and interpretation by the viewer (Cornwall, Guijt and Welbourn 1994:108); ii) PRA methods lack fixed guidelines and involve high costs and require a long duration of time to carry out (Narayan 1996:25-26); iii) PRA methods may not be understood by non-participants; iv) that the participatory process is exploitative (on the part of participants) because people's time is costly; v) the methods arouse expectations that may not be implemented (Narayan 1996:25-26); vi) PRAs exclude the realities of the less accessible members of communities such as women, the disadvantaged and marginal people who are often busy tied down by other chores (Chambers 1998:xvi-xvii); vii) that at times, the researchers do not fully understand the principles of PRA, which leads to challenges in integrating new PRA methods into their research (Baur and Kradi 2001:2); and viii) Kumar (2002:51) pointed to the dominating and unfitting behaviour of some researchers with local community members, noted that some researchers rush in and out, while others dwelt on routine repetition of a few tools that did not necessarily match the use for which they were applied.

PRA approaches have become widespread in social science research (Chambers 1998:198; Kumar 2002:15), and are becoming increasingly popular in agriculture related research and diagramming (Pretty and Vodouhe 1997; Holland and Blackburn 1998:1). Many methods have been developed which are classified under space, time and relationship<sup>55</sup> techniques (Kumar 2002:40). PRA methods

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<sup>55</sup> Space-related methods address spatial dimension of people's reality and mainly consist of mapping (social map, resource map, participatory modelling, mobility map, services and opportunities map and transects). Time-related methods explore temporal attributes of people's reality and allow people to assess time using their own concepts (time-line, trend analysis, historical transect, seasonal diagram, daily activity schedule, participatory genealogy and dream map), which are used to explore temporal attributes of people's realities.

have been successfully used to assess needs of target communities (McCaslin and Tibeziinda 1997), to study small-scale farmers and farming systems (Mureithi *et al.* 2000; Rees *et al.* 2000), to study AKIS (Den Biggelaar and Mugo 1996; Ndungu, Nkonge and Rees 2000; Rees *et al.* 2000; Garforth 2001a; Davis 2004; Best *et al.* 2005; Stefano *et al.* 2005a), and the use of ICTs in under-served rural villages (Kanungo 2004:412). As emphasised by Kumar (2002:39-40), triangulation is an important feature in PRA and the specific methods that were used in the present study were:

- *Timelines*: which facilitated the exploration of temporal dimensions from a historic perspective and capture the arrangement of landmark events and general direction as recalled by the local people. This method helped to tap into the knowledge of the elderly people (men and women) and provided a general picture of major events regarding farming systems and AKIS (Pretty and Vodouhe 1997; Kumar 2002:118). The method helped to develop a rapport with local people and was flexible, thus allowed for understanding of the historical perspective on current issues from the community. Time lines were effective icebreakers (Pretty and Vodouhe 1997:51). However, some elderly / local people were not able to recall the precise years of occurrence of events and others were reluctant to draw the timeline (Kumar 2002:118-128). This method was also used by Garforth (2001a) in studying the AKIS in Eritrea, and by Davis (2004) in the study of technology dissemination among small-scale farmers.
- *Agriculture service map*: helped to map out services and opportunities on agricultural inputs such as information, credit, seed, fertilisers, pesticides, processing, marketing and improved agricultural technology, and facilitated the researcher to focus on the perceptions of local people in terms of the importance, distance, and accessibility of agricultural services and opportunities within their vicinity. The agriculture service map also provided a clear understanding into people's feelings, aspirations, and their needs in their development, for example planning development activities (Kumar 2002:94-96, 97-100) and provided a picture that visualised the special realities of the local people, the distance to these services, their importance and accessibility by small-scale farmers.
- *Venn diagram*: also referred to as institutional or chapati diagram, helped to identify local and external, formal and non formal institutions and groups, as well as the main actors in the community, linkages and relationships between people, groups and institutions (IIRR 1996:102; Pretty and Vodouhe 1997; Kumar 2002:234). This method used circles of different sizes to represent the importance of institutions and the overlap of the circles indicated flows of information (Pretty and Vodouhe 1997:51), and the level of interaction (Kumar 2002:234). The distance from the centre represented the closeness of farmers to the contacts (Pretty and Vodouhe 1997:51) and accessibility (Kumar 2002:236). However, Venn diagrams could be difficult to facilitate and in some cases they could be sensitive (Kumar 2002:234-246). Venn diagrams helped

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Relation methods represented with flow diagrams (cause-effect flow diagrams, impact diagram, network diagrams, process maps, ranking method, venn diagram, pair-wise ranking method, matrix scoring/ranking method, force field analysis, pie diagram, livelihood analysis, spider diagram and body mapping), which help visualize the linkages between actors (Kumar 2002:40,53,118,188).

to understand the perceptions of local people about local institutions, individuals and programmes, and provided insight into the analyses of the power structure and decision making. Davis (2004) used the Venn diagram technique to study the dissemination of agricultural technology among small-scale farmers. Limitations of Venn diagrams include their becoming complex where the number of items is high, and the fact that it could be sensitive if representatives of actors being rated are present (Kumar 2002:244). dissociate

- *Network diagram*: helped to assess the level of importance of linkages between actors, focusing on the contacts of small-scale farmers, farmers' groups and communities, and depicted a picture of the depth and diversity of existing linkages, the nature and quality of relationships, functions performed by the relationships of different actors and the frequency of contact. The network diagram concentrated on the contacts of an individual, household, group or community with the outside world and emphasised the nature, quality of relationships, diversity of existing linkages, purpose or function of contact, and frequency of contact with external actors (outside the individual, household, group, organisation or community). Network diagrams allowed community members to focus on how to strengthen linkages, networks and strategic alliances with outsiders.

#### **5.5.1.3 Survey research**

According to Yin (1989:17), a survey research strategy is often designed to enumerate research questions on who, what, where, how many and how much. The survey method is useful for collecting data on population distribution, attitudes and behaviour (Peil and Rimmer 1995:56). Surveys entail selecting a sample, following which a questionnaire or interview is administered to the participants or informants (Wagenaar and Babbie 2001:136; Shaughnessy, Zechmeister and Zechmeister 2003:123). Indeed, Keogh (2004:155) described a survey as an observation of what there is in a sample of the population, where reliable data collected in a structured and systematic manner, is interpreted to represent the population. According to Sheppard (2004:97), survey research designs may be longitudinal, cross-sectional and trend or predictive. The present study adopted a cross-sectional design. The survey method facilitates the researcher to learn about a large population through surveying a representative sample and extrapolating the findings to the population, by gathering data once (single observations) over a period of time (days, weeks or months) (Bell 1987:8; Wagenaar and Babbie 2001:139; Creswell 2003:153; Sekaran 2003:135; Babbie 2004:268) or as described by Cohen, Manion and Morrison (2007:205,212-213), at a particular point in time to produce a "snapshot of the population." As discussed in **section 3.1.2.4**, cross sectional designs belong to the relativist and positivist paradigms (Easterby-Smith, Thorpe and Lowe 2002:45). The main types of survey research methods as recognised by Sheppard (2004:97) include mail questionnaires, telephone surveys and face-to-face interviews. As with all other research methods,



the survey method has its strengths and weakness and where well used, the method provides reliable and valid data (Peil and Rimmer 1995:56).

The advantages of the survey research method include i) it is efficient and economical in gathering primary data (Easterby-Smith, Thorpe and Lowe 2002:45; Cooper and Schindler 2003:322; Gravetter and Forzano 2009:372); ii) it is considered versatile or flexible in collecting data such as attitudes, opinions or expectations (Cooper and Schindler 2003:319,322); iii) it is appropriate for social and behavioural sciences (Kothari (2004:120), for example, the method has been used to assess people's feelings, thoughts, opinions and relationships among groups (Shaughnessy, Zechmeister and Zechmeister 2003:123,125); iv) it provides a researcher with a way for quantifying and weighting responses that are more meaningful (Sheppard (2004:86), and v) it is useful for making descriptive and explanatory studies of large populations (Kothari 2004:120-121), because it has the capacity to scan a wide range of issues, to paint an overall picture and provide in-depth insights through individual and focus group interviews (Cohen, Manion and Morrison 2007:96,206).

Weaknesses of the survey research method include: i) that surveys operate multiple factors and lack a mechanism to overcome non relevant influences (Dwivedi 1997:45); ii) that surveys pay little attention to the nature of the interviewing process (Pretty and Vodouhe 1997:47); iii) that it falls short of capturing, describing and understanding world views (Gephart 1999); iv) that although strong on reliability, surveys were weak on validity (Wagenaar and Babbie 2001:139); v) some authors have argued that because the respondent is reporting second hand data, this diminishes the accuracy of the information; and vi) that the survey method is inappropriate for handling certain contexts of social life and that in some cases, respondents were made to express views on experiences for which they did not have an opinion (Cooper and Schindler 2003:322,223; Babbie 2004:243-275). Other weaknesses include vii) difficulty of formulating instruments that are accurate; viii) little control over timeliness because people respond at their own time; (Hair, Bush and Ortinau 2004:257-258); ix) that surveys are inflexible; and x) the quality and quantity of data collected through the survey method was questionable (Babbie 2004:243-275). Babbie 2004) argued that quality was determined entirely by the willingness and cooperation of the informants. xi) Other critics maintain that surveys rely on "self report data," yet people's memories may be distorted or people may deliberately lie in order to give answers they hope would impress the researcher (Leedy and Ormrod 2005:184). xii) Cohen, Manion and Morrison (2007:206,208) added that the survey method is labour intensive, expensive in terms of developing questionnaires, pre-testing, training, supervising and travel time and cost. xiii) They posited that the survey research method is not appropriate where a researcher is interested in investigating small-scale factors and variables or interpersonal dynamics.

The limitations notwithstanding, Ngulube's (2005:131) study on research methodologies used by Library and Information Studies Masters students at the University of Natal confirmed that the survey method has become a popular method in social science studies. This method has also been used in the investigation of AKIS by a number of authors (Carrasco 2001; Garforth 2001a; Garforth, Khatiwada and Campbell 2003). Considering the complexity of the present study, the researcher adopted a cross-sectional survey research method to study the information providers and other AKIS agricultural actors such research institutions, extensionists, government departments, CSOs and the private sector in Kirinyaga district in Kenya. Specifically, the study surveyed small-scale farmers and partner institutions (research, extension, education, agro-inputs, agro-processors and marketers in the entire continuum from production to consumption) and investigated the sources of local agricultural knowledge and external information, content development, linkages and channels of communication, access to and sharing of agricultural knowledge and information and usage of the same as well as knowledge management and information management. The study used semi-structured interviews and questionnaires for gathering data. The instruments were pre-tested at Juja in Thika district, Kalimoni division and were refined before being used to collect data (Johnson and Christensen 2008:189).

#### **5.5.1.3.1 Interviews**

Individual interviews were held with individual farmers, and representatives of various agricultural actors, while focus group discussions were held with farmers' groups.

##### **5.5.1.3.1.1 Individual interviews**

Cooper and Schindler (2003:323) and Johnson and Christensen (2008:203) defined an interview as a two-way communication between an interviewer and an interviewee to obtain information from the latter. According to McCracken (1988:9), "the long interview is one of the most powerful methods in the qualitative armoury." McCracken (1988) argued that an interview takes the researcher to the mental world of the interviewee and reveals the logic by which the individual sees and experiences the world. Interviews help to gather data such as behaviour or attitudes (Koutsouris and Papadopoulos 1998:92). Proponents of qualitative research have described the interview method as "the best" data gathering method, the most fundamental method of data collection in qualitative research (Easterby-Smith, Thorpe and Lowe 2002:85,86), and as a core method for gathering data (Sheppard 2004:137). Sapsford and Jupp (2006:20) reaffirmed that this data is captured in the form of people's words.

Interviews may be conducted face-to-face, by telephone or online (Hair, Bush and Ortinau 2004:269; Sekaran 2003:225), and in Allan's (2003:8) opinion, face-to-face interviews are more reliable than data gathered from questionnaires. Further, interviews may be greatly structured or closed (fixed

choices), or unstructured (open-ended) (Gravetter and Forzano 2009:362; Teddlie and Tashakkori 2009:229). Structured interviews adhere to a standard set of questions, while semi-structured interviews make provision for a few tailored open-ended questions to probe respondents reasoning or to seek clarification (Pretty and Vodouhe 1997; Sheppard 2004:141-147; Leedy and Ormrod 2005:146,184). As pointed out by Kelly (2006a:298), semi-structured interviews are the most popular form of interview, and are considered appropriate where more depth is required in moving from general to specific, or where some of the questions and topics are predetermined. Elsewhere, Narayan (1996:70-72) made the point that semi structured interviews allow other questions to arise during an interview. According to Pretty and Vodouhe (1997:51), semi-structured interviews are crucial in participatory approaches.

The advantages of interviews include: i) the assertion that interviews permit the researcher to access individuals without violating their privacy (McCracken 1988:10; Easterby-Smith, Thorpe and Lowe 2002:86). ii) Interviews assume a personal approach which yields more satisfactory results (Peil and Rimmer 1995:71), iii) while ensuring a higher response rate and allowing the researcher the opportunity to clarify ambiguous questions (Peil and Rimmer 1995:71; Babbie 2004:263-4; Leedy and Ormrod 2005:185; Cohen, Manion and Morrison 2007:218). iv) Further, interviews permit the researcher to establish trust and rapport with the respondents thus winning their cooperation (Leedy and Ormrod 2005:185; Cohen, Manion and Morrison 2007:218). v) In addition, interviews are a more natural method of interacting with people (Kelly 2006a:297) and vi) are more flexible than questionnaires and provide opportunity to control the interview process (Cohen, Manion and Morrison 2007:218). vii) Cohen, Manion and Morrison (2007:218) emphasised that interviews guarantee that responses are provided by the respondent only. viii) Finally, interviews have the ability to gather data from respondents who cannot read or write (Cohen, Manion and Morrison 2007:218).

Limitations of the interview technique include i) the fact that the method is expensive and time consuming (McCracken 1988:27; Peil and Rimmer 1995:71; Easterby-Smith, Thorpe and Lowe 2002:86; Leedy and Ormrod 2005:185). ii) Paradoxically, interviews may infringe the privacy of respondents and make interviewees feel inconvenienced or intruded upon by the interviewer (McCracken 1988:27; Easterby-Smith, Thorpe and Lowe 2002:86; Cohen, Manion and Morrison 2007:218-219). iii) Krueger and Casey (2000:5) argued that the questions take the lead in the interview technique, while the respondent plays a passive role. They contended that the respondent might be limited by the choices offered in closed ended interviews, and that this inadvertent restriction could tilt the interview to the thoughts of the researcher. iv) Interviews require highly trained interviewers and not all respondents may be accessible to the researcher (Cooper and Schindler 2003:324). Other limitations include v) the perceived view that interviews are subjective and contextual by virtue of the interaction of the researcher with respondents (Sheppard 2004:82;

Cohen, Manion and Morrison 2007:218-219). vi) Over and above these limitations, authors have stated that interviews call for on-the-spot answers yet the respondent may require time to consult documents and other sources hence may pave the way for interviewer bias and subjectivity (Cohen, Manion and Morrison 2007:218-219).

The present study used semi-structured interviews, as was the case with previous AKIS studies by Den Biggelaar and Mugo (1996) in Kenya, and (Garforth 2001a) in Eritrea. Davis (2004) also used semi structured interviews to study the dissemination of agricultural technology among small-scale farmers in Kenya. The justification for adopting the interview technique was because the main purpose of the research was to understand the different actors in the agricultural theatre. Interviews were conducted in both the qualitative and quantitative approaches to collect data from small-scale farmers, farmers' groups, key informants and information providers. Interviews conducted in the quantitative study (information providers) were more structured than those in the qualitative study (small-scale farmers and key informants). Face-to-face interviews were conducted and questions on the questionnaire and interview protocol (see **Appendix 9** to **Appendix 16** were posed orally to give the researcher the opportunity to clarify any outstanding issues; obtain insights of the respondents and ensure a higher response rate (Babbie 2004:268-272); to help the researcher to understand the beliefs and values of the respondents (Creswell 2003:186; Babbie 2004: 268-272; Leedy and Ormrod 2005:184); and to win the trust and cooperation of respondents (Leedy and Ormrod 2005:184).

The present study used Dervin's Sense making interviewing technique, which is based on the Sense-Making methodology and the Sense-making theory and was used for gathering data (see **section 3.2.2.1** and **section 5.1.5**). As stated by Dervin (1999), the Sense-making interview "is self consciously focused not on interpretations *per se*, but on interpretings." This implies that the respondent deconstructs the world and allows the researcher to view the internal process of the respondent's understanding and interpretation. The process also pays "empirical attention" to the world of the individual and allows respondents to describe their worlds in their own terms and meanings. The Sense making interviewing technique provided for in-depth investigation on what the agricultural actors (especially small-scale farmers) really think, feel, want and dream through asking questions such as what, why, and how over time and space in adherence to the Sense-making metaphor of situation, gap, bridge and outcome. As explained by Dervin (1998:42) the technique enabled people to talk freely and naturally without blocking their thinking or affecting their emotions and this ambience called for respectful listening, thus exposing the internal process of an individual's interpretation (Dervin and anonymous students 1997; Dervin 1999; Dervin and Clarke 1999).

In addition, the present study combined the three qualitative interviewing approaches advanced by Patton (2002:342) (not mutually exclusive) namely i) the informal conversational interview (natural

flow of an interaction), ii) the general interview guide approach (outline of a set of issues that are to be explored), and iii) the standardised open-ended interview (carefully worded questions arranged with the intention of asking each respondent the same questions and through the same sequence and words). This mix provided flexibility in probing based on what was considered most appropriate to explore, what informants needed greater depth on or what additional questions not anticipated needed to be posed. The interview guides for interviews with individual farmers, representatives of institutions, key informant and focus group discussions are presented in **Appendices 10 to 16**.

#### **5.5.1.3.1.2 Focus group interviews**

Focus groups have become increasingly popular in social science research (Finch and Lewis 2003:171; Krueger and Casey 2000:5,10-11). Focus groups are special types of group interviews that concentrate around a central purpose and whose discussions are led by a moderator and directed towards a common interest (De Vos 1998:313-326; Cooper and Schindler 2003:155; Kelly 2006a:304; Johnson and Christensen 2008:209; Rubin, Rubin and Haridakis 2010:222). Focus groups are socially oriented, and this orientation allows group members with certain homogeneous characteristics to participate in an interview to explore a focused topic and allow crosscutting perspectives (Sheppard 2004:152,153). Focus group discussions are thus like intensive group interviews (Rubin, Rubin and Haridakis 2010:222), and provide small glances of “worlds” through listening and paying attention to the wisdom of people who share common characteristics (Krueger and Casey 2000:xi,xiii,11). They concluded, “focus groups present a more natural environment than that of the individual interview because participants are influenced by others – just as they are in real life.” The openness, frankness and disclosure during discussions are influenced by socio-demographic factors such as age and gender (Finch and Lewis 2003:191). They further argued that respondents tend to be more comfortable and free among people who have shared experiences, but do not know each other. However, Barbour and Schostak (2005:41) considered it more advantageous to convene focus groups of people who know each other (close to real-life situations or the case of professional teams or peer groups), as opposed to total strangers to discuss their experiences.

Advantages of focus groups include i) the promotion of self-disclosure for example on what people feel and think among participants; and ii) provision of trust and courage among fellow respondents (McCracken 1988:28; Krueger and Casey (2000:7); and iii) saving time and resources by handling several participants simultaneously and offering synergistic effects through interactions among participants (Finch and Lewis 2003:171; Leedy and Ormrod 2005:146). For example, the fact that respondents can react to each other’s responses spontaneously leads to greater depth of understanding from different frames of reference (Cooper and Schindler 2003:157; Finch and Lewis 2003:155,171). This reciprocity enables the sharing of inter-subjective experience by a community (Kelly (2006a:304). Furthermore, iv) focus groups offer flexibility and depth, which makes them efficient in

collecting qualitative data from a large number of people (Sekaran 2003:220; Sheppard 2004:153). Tashakkori and Teddlie (2003:310) maintain that focus group are v) useful for exploring ideas; vi) facilitating interpretive validity; and vii) allowing for further inquiry or probing. Focus group discussions viii) provided in-depth information within a shorter period (Johnson and Christensen 2008:210); ix) yielded results that were easy to understand; and x) data collected complemented data obtained from other methods. It was further observed that focus group discussion techniques xi) allowed for both interviews and obtrusive observation (Teddlie and Tashakkori 2009:227).

In spite of these advantages, authors have observed a number of limitations with focus group interviews. i) Fern (2001) noted that some people signed up for a group but failed to turn up for the interview; ii) in some instances, the researcher may not have adequate skills to be in full control over the proceedings and may experience difficulties with recording, transcribing and analysing data. iii) Cooper and Schindler (2003:157) pointed out that sampling accuracy is a challenge with focus groups, and this may not allow generalisation of results. Stressing this point Barbour and Schostak (2005:43-44), argued that focus groups are not representative of the population and are not effective in measuring attitudes or eliciting the “real views” of group members. iv) Linked to Fern’s (2001) emphasis above on skills, Barbour and Schostak (2005:43-44) argued that focus groups require excellent facilitation to prevent some individuals from dominating discussions and encourage shy members to contribute. Tashakkori and Teddlie (2003:310) maintain that v) carrying out focus group discussions may be expensive and vi) data analysis may be time consuming. Nevertheless, the present study adopted focus group discussions to solicit views of small-scale farmers’ groups. Dervin (2007) demonstrated the application of the Sense-Making methodology to focus groups and argued that this approach provides a full picture of the sense-makings of the different users. Building on this application, focus group discussions of the present study were based on Dervin’s Sense-Making methodology.

Various suggestions have been advanced regarding the number of groups and the size of groups. Krueger and Casey (2000:26,27) proposed three or four focus groups with each category the researcher selects and left it at the discretion of the researcher to determine if s/he has reached the saturation point. Krueger and Casey (2000) advised that available resources should guide the decision on the number of people in the focus groups, but hinted that about 30 groups were sufficient. Bryman (2004:346-361) recommended group numbers of eight to 22 but pointed out that the general trends were from 10 to 15 depending on the assessment of the moderator. The present study adopted Krueger and Casey’s (2000) suggestion of leaving the decision on number of focus group to the discretion of the researcher. In total 90 focus group discussions were carried out in four divisions and were moderated by 28 facilitators to allow multiple perspectives. The reason for the large number of focus groups was that farmers’ groups were diverse and dealt with a wide range of agricultural

enterprises produced under diverse agroecological conditions. This decision also allowed for participation of more farmers.

There are various recommendations on group sizes. De Vos (1998) suggested group sizes of nine to 12 people, while Krueger and Casey (2000:10) proposed five to 10 people per group but added that this could range from four to 12. These authors advocated for small enough groups to provide all participants with an opportunity to share insights and ideas but large enough to provide diversity of perceptions. Finch and Lewis (2003:193) and Tashakkori and Teddlie (2003:308) recommended groups of six to eight participants and argued that groups should not be smaller than five or six and should not exceed eight participants or else members may not be able to participate actively. On the other hand, Sekaran (2003:220) proposed groups of eight to 10 people, Bryman (2004:346-361) of six to 10, while others (Sheppard 2004:152; Johnson and Christensen 2008:209; Rubin, Rubin and Haridakis 2010:222) suggested six to 12 people per group. Leedy and Ormrod (2005:146) argued that the group sizes should not be more than 10 or 12. The present study adopted Krueger and Casey's (2000:10) suggestion of group sizes of four to 12 individuals. The groups were stratified by type of group (female only, male only, mixed and youth only), and by farming enterprise to cater for homogeneity (Fern 2001).

Krueger and Casey (2000:31-33) proposed four focus group design options: i) the single-category design, which focuses on one information rich group for example the youth, ii) multiple-category design, which focuses on groups with several audiences that allow for comparisons, iii) double-layer design, which involves geographic areas as first layer and different audiences as the second layer and comparisons can be made between any of the layers, and iv) broad-involvement design, which includes studies with widespread public interest. The present study adopted the double-layer design, where the first layer comprised the four divisions in Kirinyaga and their respective locations and sub-locations, and the second layer comprised of the strata by type of group (female only, male only, mixed and youth only) and by enterprise. In sum, the present study conducted 90 focus group interviews and each focus group comprised four to twelve individuals. An interview guide was developed to lead the process (see **Appendix 10**). Enumerators were trained to assist with interviewing the sample group selected from the study population and interviewees were asked the same set of questions (Pretty 1994:40). Data was recorded through note taking. Audio recording was not done because some focus group members were not comfortable with being recorded (Kelly 2006a:307).

#### **5.5.1.3.2 Questionnaires**

Questionnaires are devices that solicit answers to questions using a form (Dwivedi 1997:101). Questionnaires have also been defined as a set of questions or statements that are formulated in advance and to which respondents record their views (Sekaran 2003:236; Johnson and Christensen

2003:170), and provide qualitative and quantitative data (Lewin 2005:219) through self-reporting (Teddlie and Tashakkori 2009:232). Questionnaires are the most dominant mode of data collection (Kumar 2002:106), and were “a powerful scientific instrument for measuring different variables” (Shaughnessy, Zechmeister and Zechmeister 2003:147). Easterby-Smith, Thorpe and Lowe (2002:38,132) argued that from a relativist point of view, questionnaires provide a structured and standardised format of data collection that ensure the same questions are asked to each individual. Questionnaires may be open ended – where respondents provide their own points of view or closed-ended where respondents select answers from options provided (Peil and Rimmer 1995:78; Lewin 2005:219-220; Teddlie and Tashakkori 2009:232). Open-ended questions provide respondents the freedom to choose the aspect, form, detail and length of his / her answer (Moser and Kalton 2004:83), and are better suited to gathering qualitative data. Questionnaires may be administered personally, mailed (surface mail or couriered), hand delivered, computer delivered or faxed (Cooper and Schindler 2003:324; Sekaran 2003:236), or online (Hair, Bush and Ortinau 2004:269). According to Babbie (2004:256), it is best to ask people to complete the questionnaire.

The questionnaire method for data collection has several advantages: i) the questionnaire is considered indispensable in directing the scope of discussion and ensuring the researcher covers all the areas of the research in the same order for each respondent (McCracken 1988:24-25). ii) Questionnaires allow respondents the freedom to provide their own points of view or testimonies freely (McCracken 1988:24-25; Dwivedi 1997:105); iii) facilitates collection of data relatively quickly and cheaply (Bell 1987:58; Dwivedi 1997:105; Teddlie and Tashakkori 2009:232) because they can be sent out to many people simultaneously over a large geographical area (McCracken 1988:24; Cohen, Manion and Morrison 2007:218). iv) Questionnaires do not exert pressure on the respondents (Dwivedi 1997:105); and assure anonymity hence respondents can be more truthful (Leedy and Ormrod (2005:185). v) Furthermore, questionnaires use standardised wording hence allow for comparison of results across respondents (Cohen, Manion and Morrison 2007:218) and vi) are considered appropriate in large scale surveys (Peil and Rimmer 1995:70; Shaughnessy, Zechmeister and Zechmeister 2003:137).

Pretty and Vodouhe (1997) indicated that there were some problems with questionnaire surveys and argued that: i) questionnaire designers developed the data collection tools in advance yet the researchers may not know what is important for the local people. ii) It has also been argued that questionnaires may not allow people’s realities to come out (Kumar 2002:316). iii) Questionnaires can be limiting in explaining observed phenomena (Easterby-Smith, Thorpe and Lowe 2002:45). iv) Moreover, Kumar (2002:42) considered the questionnaire approach to be “top-down,” biased and a method of “stealing” because the researcher takes away the data and facts from the community. v) The questionnaire may also end up being too long because researchers focus on not missing out issues



they consider of worth to the local people (Sheppard 2004:74). vi) Some authors observed that it may not be possible to study some topics through questionnaires (Wagenaar and Babbie 2001:139; Sheppard 2004:81). Other challenges include vii) low return rate; viii) completed questionnaires not being representative of the sample they were sent out to; ix) misinterpretation of questions and incompleteness (Leedy and Ormrod 2005:185; Cohen, Manion and Morrison 2007:218); and x) problem of remembering events from the past (Beins 2004:210).

Pretty and Vodouhe (1997) stated that “agricultural institutions of all types have long relied on questionnaire surveys” at all levels, and despite their limitations, questionnaires remain “remarkably popular.” Questionnaires have been used in the study of AKIS by various authors (Den Biggelaar and Mugo 1996; Garforth 2001a). Considering the numerous advantages of questionnaires, the present study used the questionnaire technique to investigate agricultural information providers in Kirinyaga district. A semi-structured questionnaire was designed with a combination of open-ended and closed questions to collect quantitative and qualitative data from information providers in various agricultural institutions, which work with small-scale farmers. The questionnaire was sent to information providers whose names were mentioned by informants in Kirinyaga district and had libraries or information centres. The questionnaire was sent to eight information providers in Nairobi and Kirinyaga district. Some of the information providers were interviewed personally (face-to-face), while others completed the questionnaire and they were collected personally. To address the problem of non-response, follow-up calls were made to the original contacts (Cooper and Schindler 2003:332; Teddlie and Tashakkori 2009:232), and three reminders were sent out to individuals who had not responded. As suggested by Shaughnessy, Zechmeister and Zechmeister (2003:152), clear and concise instructions were sent to respondents to ensure reliable data was collected. Out of the eight, four responses were received.

#### **5.5.1.4 Observation**

Observation has been defined as the process of seeing and recording what is spontaneously happening in a particular situation in the same style (Narayan 1996:65; Dwivedi 1997:127; Sekaran 2003:252; Jones and Somekh 2005:138; McBurney and White 2007:216,220). The observation technique depicts behavioural patterns in different natural situations (Dwivedi 1997:128; Tashakkori and Teddlie 2003:312; Johnson and Christensen 2008:211), and helps to reveal characteristics of groups or individuals who may be difficult to discover using other means (Bell 1987:88). The observation method is not only considered reliable (Bell 1987:88; Sekaran 2003:253), but also accurate (Cooper and Schindler 2003:405; Sapsford and Jupp 2006:59) and a powerful approach to gathering qualitative data (Patton 2002:11). Further, observation enables the researcher to collect first hand data on phenomena or those being observed as they occur naturally (Bell 1987:88; McBurney and White 2007). According to Wilson (2002a), observation is the original method of gathering data on

phenomena in all disciplines and “much of what we know comes from observation” (Cooper and Schindler 2003:400). Where carefully planned, observation is acknowledged as scientific inquiry to answer a research question(s) or to supplement other methods (Cooper and Schindler 2003:400; Shaughnessy, Zechmeister and Zechmeister 2003:17), and has been described as “the principal basis of scientific description” (Shaughnessy, Zechmeister and Zechmeister 2003:40).

The primary goal of observation is to describe the behaviour (Shaughnessy, Zechmeister and Zechmeister 2003:84) of individuals, groups and organisations (Dwivedi 1997:126). Observation is thus a popular method in the behavioural sciences (Kothari 2004:96), and is considered an important technique for collecting data when information is considered sensitive and when a high degree of reliability and accuracy is desired (Narayan (1996:65; Jones and Somekh 2005:138). The observation process involves watching, listening, reading, smelling, touching and tasting (Cooper and Schindler 2003:402; Jones and Somekh 2005:138; Sapsford and Jupp 2006:57). Observation enables the capturing of the “whole” event and provides information on the environment, behaviour and actions of those who cannot speak for themselves or complete questionnaires (Cooper and Schindler 2003:405; Sapsford and Jupp 2006:59). Emphasis of the observation technique needs to be on what to observe, when to observe, how to record, and how much inference is required (Frankfort-Nachmias and Nachmias 1996:206-7,282-285).

The observation method has several advantages including: i) being able to understand and capture the natural context within which people interact thus providing a first hand holistic perspective; ii) the elimination of bias; iii) the capturing of current information; iv) the simplicity of the method and the fact that the method is independent of the willingness of the person being observed (Kothari 2004:96). v) For Kelly (2006a:307), observation studies draw the researcher closer to the action by facilitating real-time data capture as “things are actually happening.” vi) In addition, observation enables the researcher to test her common-sense theories about the social world and to produce knowledge (empirical and theoretical) about specific issues (Sapsford and Jupp 2006:58). vii) Furthermore, observation was considered suitable for studying small groups that are separated from the population (McBurney and White (2007:216,220).

Nevertheless, the observation technique has been criticised for i) being subjective, and some authors have argued that bias may creep in during interpretation of observations (Frankfort-Nachmias and Nachmias 1996; Cooper and Schindler 2003:406; Beins 2004:277,279; Jones and Somekh 2005:138; Sapsford and Jupp 2006:59); ii) being time consuming, as the method focuses on a few selected individuals and presents results in descriptive information that require interpretation (Narayan 1996:67; Kothari 2004:96); iii) requiring the physical presence of the researcher (Sekaran 2003:254); iv) calling for “disciplined training and rigorous preparation”; and v) requiring discipline in recording

field notes (Patton 2002:23,260-61; Cooper and Schindler 2003:406; Sekaran 2003:254; Creswell 2007:139). vi) In addition, it has been observed that people have a tendency to change their behaviour when they know they are being observed (Patton 2002:292; Kelly 2006a:309). vii) Observation is also labour intensive and relatively expensive; and viii) provides limited information (Kothari 2004:96). For example, observation may not be able to divulge the beliefs or sentiments of respondents. Jones and Somekh (2005:138) concurred with Kothari (2004:96-97) and explained that human behaviour is very complex, hence it may not be possible to collect sensory data, make sense out of the impressions, make interpretation and at the same time record all the mental images. Other critics of the observation technique have argued that ix) there can be no perfect repeatable observation (Denzin and Lincoln 2005a:454). x) Finally, some authors have cited problems pertaining to invasion of privacy (McBurney and White 2007:220-221).

Observation is classified as structured and relatively unstructured (Dwivedi 1997:134). Observation may also be direct or indirect (Wilson 2002a), and can be used to gather both qualitative and quantitative data (Easterby-Smith, Thorpe and Lowe 2002:132; Leedy and Ormrod 2005:145). On their part, Shaughnessy, Zechmeister and Zechmeister (2003:91) distinguished three important methods of observation namely: i) participant observation, ii) structured observation and iii) field experiments. Kelly (2006a:309-310) made three further distinctions namely: i) descriptive, ii) focused and iii) selective observations. Under structured observation, a systematically structured schedule is developed in advance to guide what to observe and how to record it (Narayan 1996:67-68; Shaughnessy, Zechmeister and Zechmeister 2003:91; Kelly 2006a:308-309). Data collected are generally in the form of the researcher's descriptions (Sapsford and Jupp 2006:20,57). The participant observation method requires that the observer participates to varying degrees in the situation being observed to describe what goes on, who or what is involved, when and where things happen, how they occur and why (Jorgensen 1989:12; Jones and Somekh 2005:140).

The degree of participant observation lies on a continuum between full participant and being a spectator (Patton 2002:265; Sekaran 2003:252). Other authors (Shaughnessy, Zechmeister and Zechmeister 2003:91,115; Rubin, Rubin and Haridakis 2010:223) referred to participant observation as obtrusive and unobtrusive, where obtrusive observation entails the participation of the researcher in the activities of the groups or individuals being observed without disguising themselves, while under unobtrusive or naturalistic observation, a disguised researcher observes the individual or group in a natural setting without participating (Baker 2006:74; Gravetter and Forzano 2009:356; Rubin, Rubin and Haridakis 2010:223). In other words, the unobtrusive observer, also referred to as "complete observer" plays a passive role in the natural setting without interacting with insiders (Baker 2006:74; Gravetter and Forzano 2009:356), which is advantageous in that it does not interfere with the groups or individuals being observed (Johnson and Christensen 2008:211). Further, information

obtained through unobtrusive measures provides room for confirming or challenging the validity of conclusions arrived upon (Shaughnessy, Zechmeister and Zechmeister 2003:92).

Despite the widespread use of observation in social science research, only a few authors (Carrasco 2001) have used this method in the study of AKIS. Nevertheless, for the reasons discussed above, the present study adopted the descriptive, structured, unobtrusive observation technique to supplement data collected using other methods. An observation checklist was developed to guide observation of small-scale farmers and farmers' groups in their natural setting (see **Appendix 17**). The researcher also observed activities of farmers' groups, individual farmers and other actors during the PRA exercises. Validity and reliability in observations were addressed through triangulation of data sources and methodologies and through ensuring that information observed was consistently entered into appropriate categories (Cohen, Manion and Morrison (2007:158-159) (see **section 5.8** below).

#### **5.5.1.5 Data collection tools, translation and pre-testing**

The decision on what questions to include in the data collection tools used in the present study were determined from the research objectives and research questions (Bell 1987:58; Dwivedi 1997:107). In developing the questions, the researcher took into consideration whether the respondents possessed the knowledge or had access to the information required for providing correct answers. Further, the researcher aimed at making the questions simple, specific and unambiguous, and avoided questions that were leading, presuming, embarrassing and involving memory (Moser and Kalton 2004:74,76-82). As advised by Neuman (2006:278), jargon, slang and abbreviations, ambiguity and confusion, emotional language, double barrelled questions, leading questions, questions that are beyond the capability of the respondents, false premises, questions on intensions in the distant future and double negatives and unbalanced responses were avoided. The draft interview guides for farmers' groups, farmers belonging to a group and farmers not belonging to a group were translated into Kiswahili. Translation was considered necessary because most rural people in Kirinyaga district spoke Kiswahili and Kikuyu. Translation was carried out by the researcher with assistance from a linguistics expert.<sup>56</sup>

Pre-testing has been described as the process of trying out the instrument(s) on a small number of respondents before it is used in the main study, or trying out the questionnaire in the field to a similar or actual sample that the researcher plans to use (Mugenda and Mugenda 2003:78-79). There is wide consensus on the importance of pre-testing data collection instruments to ensure that questions are clarified and are well understood by the respondents; that there is no ambiguity (Reynolds and Diamantopoulos 1998:480; Janes 1999:322; Easterby-Smith, Thorpe and Lowe 2002:134; Babbie

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2004:256; Moser and Kalton 2004:73; Neuman 2006:191,277,312; McBurney and White 2007:216,220); to enable the researcher to test the length and sequencing of questions (Easterby-Smith, Thorpe and Lowe 2002:134); to discover errors (Reynolds and Diamantopoulos 1998:493); to help in training the research team (Cooper and Schindler 2003:389-390); to rectify any inadequacies and to reduce biases; to determine how appropriate and comprehensive the questions are; to reveal questions that are vague (Sekaran 2003:249); to protect against redundancy of questions (Babbie 2004:256); to assess marginal questions (Moser and Kalton 2004:73-74) and to refine and perfect the instruments (Synodinos 2003:225).

Pre-testing also helped to determine the time required to complete the questionnaire or interview which is essential for budgeting, and helps to improve reliability (Neuman 2006:277). Besides, pre-testing aided in discovering the reactions of respondents to the questions and facilitated the assessment of participant interest. Testing the instruments on a few cases provided a good idea of the kind of data the study would generate (McBurney and White 2007:228-229), gave the researcher an opportunity to assess whether it is possible to analyse the data using the data analysis methods selected (Easterby-Smith, Thorpe and Lowe 2002:134; Sekaran 2003:249). As concluded by McBurney and White (2007:228), failure to pre-test the protocol on some informants could be disappointing and could affect the precision of the study. In this regard, the draft data collection instruments of the present study were pre-tested and revised before arriving at the final set. Mugenda and Mugenda (2003:79) suggested that the number of pre-test cases should not be very large (between 1% and 10%), depending on the sample size (the bigger the sample, the smaller the percentage). However, Leedy and Ormrod (2005:188,192) suggest that the instrument(s) be tried out on about half a dozen friends, colleagues or volunteers, to see whether they have difficulty in understanding any items.

A convenience sample was selected to pre-test the instruments based on accessibility. Pre-testing was carried out between 6-11 May 2008, through face-to-face interviews. The draft data collection instruments (interview guides, questionnaire and observation checklist) were pre-tested in Thika district, Juja location, Kalimoni sub-location (a rural setting about 40km from the city of Nairobi characterised with smallholdings, practicing largely subsistence farming). These instruments were tried on two focus groups of informants belonging to an informal women's farmer group, and three young men belonging to an informal youth farmers' group. The instrument for individual farmers belonging to a farmers' group was tried out on a female farmer, while the instrument for farmers not belonging to a farmers' group was tried out on a male farmer. The key informant checklist was pre-tested on a community development leader in Nairobi, who is also a model farmer in Juja. Respondents asked questions where the Kiswahili or English terms used on the questionnaire were

too technical, or where they did not understand the meaning. Questions on the observation checklist that could not be answered through unobtrusive observation were deleted.

The stockist interview guide pre-test was carried out on a stockist in Kikuyu division in Kiambu district (an agricultural rural setting about 25km from the city of Nairobi), because it was convenient and cost-effective. The information providers' questionnaires and NGOs checklist were pre-tested in Nairobi on three individuals working in NGOs, and one international organisation, who were experts in providing agricultural information to different agricultural actors including farmers. Similarly, the questionnaire for government ministries was pre-tested on a retired extension worker in Nairobi, who formerly worked with the Ministry of Agriculture and had worked extensively in various rural areas in Kenya. The profile on the pre-test respondents is presented in **Appendix 8**. The researcher took notes on the process and observed the body language of informants and the questions they asked. Later, the researcher tried to code the data to assess the type of data provided and the statistical analysis that will be required. Feedback from the pre-tests was used to refine the instruments.

Pre-testing helped the researcher to revise, modify and correct questions, and to check whether the questionnaire and interview guide were coherent and complete. Ambiguous and unclear questions were clarified, and double-barrelled questions were decomposed. Pre-testing also aided to streamline the ordering and flow of questions, to eliminate repetitions and determine what to do with marginal questions. Following Kelly's (2006a:300) suggestion that because people find it hard to concentrate, an interview should last from 20 minutes to one and a half hours because, the length of the instruments was reduced. In addition, pre-testing guided the researcher to provide definitions of technical terms where appropriate (Janes 1999:322-323). The technical language (Kiswahili) use in the translations was also toned down to enable the rural people to understand. Some of the open-ended (Yes/No) questions were removed and replaced with open ended questions to allow the farmers the freedom to express themselves. Additional questions picked up during the pre-test that were previously left out of the instruments were added. The pre-tests further provided an indication of the length of time it would take to carry out the interviews / complete the questionnaire. The data collected appeared likely to provide information that could be analysed. Generally, all the questionnaires were too long because similar questions had been asked under different sections. The questions that were repeated or were redundant were picked up during interviews and were later deleted, and some of the open-ended (Yes / No) questions were also removed. The Kiswahili translation of technical words were modified for the rural community. The revised data collection instruments are presented in **Appendix 10 to Appendix 12**.

### **5.5.2 Secondary data collection methods**

Secondary data or “existing or available data” (Johnson and Turner 2003:314), was defined as information that has been collected by others for different purposes that could be qualitative or quantitative (Stack 2004:115; Johnson and Christensen 2008:217). Secondary information or desk research (Stewart 1984:13), or existing data (Johnson and Christensen 2008:217), or unobtrusive measures (Teddle and Tashakkori 2009:223) provides a foundation for problem formulation and guides the design, analysis and interpretation of new information (Stewart 1984:13). Indeed desk research is considered indispensable in most types of research (Sekaran (2003:222). The use of secondary data has several advantages including: i) that it is relatively cheap (in terms of time and cost) to collect secondary data (Sekaran 2003:223); ii) in some cases secondary data is the only information available; iii) this method provides historical data and reveals the decision making patterns over time thus helping to avoid duplication (Cooper and Schindler 2003:152); iv) is useful for corroboration; v) is unobtrusive; and vi) is easy to analyse (Johnson and Turner 2003:317). As discussed in **section 5.5.2**, the use of secondary information could vii) partially or fully answer the research question; viii) yield more accurate data; ix) be used for making comparisons or provide baseline measurements or help to enhance the credibility of research results (Cohen, Manion and Morrison 2007:194).

The limitations of using secondary data were: i) that data used is often collected by others for different purposes and this data may be outdated and misleading when used for interpretations (Stewart 1984:15; Sekaran 2003:223; Lewis 2003:61). ii) Secondary data collection methods are considered to be inefficient in making new discoveries (Cooper and Schindler 2003:152); iii) there may be problems with access to information such as classified information or that which is published; iv) the data collected may not be of high quality (Lewis 2003:61); v) the data may be incomplete; (Johnson and Turner 2003:317) and vi) access to unpublished documents may prove challenging (Cohen, Manion and Morrison 2007:194). In sum, Leedy and Ormrod (2005:272) stated that “no researcher can ever glimpse “Absolute Truth,” nor can anyone even perceive the data that reflect that Truth except through imperfect senses and imprecise channels of communication.” Cohen, Manion and Morrison (2007:194) cautioned that the value of secondary sources should not be minimised, and that it is important to combine primary and secondary data. The present study used secondary information to complement data collected using primary data collection methods, and to provide comparison with similar studies.

### **5.6 Measurement of variables**

Variables were defined as constructs that a researcher studies or qualities that assume two or more values (Dwivedi 1997:33; Durrheim 2006:42) that can be measured. On the other hand, Sekaran (2003:87) viewed variables as “anything that can take on differing or varying values.” Sekaran

(2003:88) proposed four types of variables namely dependent (or criterion), independent, moderating and intervening variables, while Sheppard (2004:115) distinguished two groups of variables namely dependent and independent. The dependent variable refers to the variable of primary interest to the researcher or as described by Sekaran (2003:88) “that which lends itself for investigation.” It is the variable that is acted upon. On the other hand, the independent variable(s) are those that do the acting or that influence the dependent variable (Sekaran 2003:88-89; Sheppard 2004:115). In addition to the dependent and independent variables, Durrheim (2006:42) added the mediating variables (those that influence the relationship between independent and dependent variables), and the extraneous variables (those not related to the research (nuisance) but affect the dependent variable).

According to Hubbard (2010:3), anything that can be observed can be measured. Measurements provide the record of systematically and standardised observations that depict the scientific method (Shaughnessy, Zechmeister and Zechmeister 2003:24). Cooper and Schindler (2003:221-222) defined measurement as the process of “assigning numbers to empirical events in compliance with a set of rules,” with the aim of providing high quality data, while Leedy and Ormrod (2005:21) considered measurement to be the process of “limiting the data of any phenomenon – substantial or insubstantial – so that those data may be interpreted and, ultimately, compared to an acceptable qualitative or quantitative standard,” and each unit is directed by a numerical restraint. In order to measure variables, it is necessary to operationalise and define concepts (Sekaran 2003:176-184; Shepard 2009:36; Hubbard 2010:47-48). Operational definitions for the present study are provided in the definition of key terms in the preliminary pages. These definitions, which were guided by previously published studies, provided a common understanding of the variables to be measured (Shaughnessy, Zechmeister and Zechmeister 2003:101). Furthermore, the definitions and the literature review guided the researcher on questions to ask and facilitated the measurement of concepts. As observed by Durrheim and Painter (2006:142-147), the first stage of measurement is conceptualisation (description of the concepts and constructs being measured). Subsequent stages include operationalisation (making the meaning of the concepts and constructs more precise – that is into observable indicators), validity, and reliability respectively. The data collection instruments should thus reasonably measure the variables the instruments are supposed to measure.

For the present study, agricultural knowledge and information systems formed the primary or dependent variable(s). The independent variables comprised the information needs and information seeking behaviour of small-scale farmers, sources of local agricultural knowledge and external information, linkages between the various agricultural actors, flows of local knowledge and external information, channels of communication and ICTs used to share and exchange information. Other independent variables identified for this study included farmers’ decision making, innovation and problem solving, as well as knowledge management practices, information management practices



and user satisfaction. In addition, barriers that farmers face in accessing agricultural knowledge and information formed the set of independent variables.

Some authors have argued that where results are consistent, the measures are reliable and where the data collected represents the true position, the measures are valid (Peil and Rimmer 1995:8). In agreement with this argument, Shaughnessy, Zechmeister and Zechmeister (2003:25) asserted that the use of accurate and precise instruments could enhance validity and reliability. The present study was guided by Shaughnessy, Zechmeister and Zechmeister (2003:101), who suggested that reliability and validity of qualitative measures could be improved by developing specific research questions. The present study developed specific research questions pertaining to AKIS and information behaviour using the variables discussed above (see **section 1.4**). Quantitative measures taken were determined by the scales of measurement that the researcher used. Scales were described as a measure of a construct that is made up of one or more indicators of the construct (Durrheim and Painter 2006:145). Four levels of measurement were labelled for quantifying data, comprising i) nominal, ii) ordinal, iii) interval and iv) ratio scales (Cooper and Schindler (2003:223; Sekaran 2003:185; Kothari 2004:71; Lewin 2005:221-222; Leedy and Ormrod 2005:25; Cohen, Manion and Morrison 2007:502).

The scales used in the present study were determined by a number of factors. Wright (2003:127) pointed out that the scales of measurement are not inherent in any particular variables. For Wright (2003), the level of measurement was implicit in the theories upon which the variables are based. Further, Cooper and Schindler (2003:250) suggested that the study objective(s), the response form and data properties need to be taken into consideration. In addition, Durrheim and Painter (2006:157) recommended that statistical decisions be guided by the four levels of measurement. However, Durrheim and Painter (2006:157) provided room for researchers to “break the rules” wherever these levels were not in agreement with the research question. Cohen, Manion and Morrison (2007:502-503) also emphasised the need to justify the classification of variables under the four scales. In deciding on measurement scales to use, the present study followed the recommendations discussed above by Wright (2003:127), Cooper and Schindler (2003:250), Durrheim and Painter (2006:157) and Cohen, Manion and Morrison (2007:502-503). The measurement process entailed: i) selecting variables and empirical events that were to be observed, ii) developing a scheme for assigning numbers or symbols to represent aspects of the event being measured and iii) applying the mapping rules to each observation of that event (Cooper and Schindler 2003:221-222). The present study measured characteristics of small-scale farmers focusing specifically on their information needs and information seeking behaviour, their sources of agricultural information and knowledge and usage of the information and knowledge. Further, the study measured linkages between key agricultural actors with emphasis on small-scale farmers, how

they generate and share knowledge and information and ICTs and communication channels they used.

The present study collected nominal data such as gender, and small-scale farmers' categories - those belonging to farmers' groups and those not belonging to farmers' groups or by the enterprise engaged in. The study also used the simple category scale of Yes / No). The ordinal scale was used to measure usage of information and knowledge and user satisfaction with available information services, communication channels and ICTs among others. Examples of data collected using ratio scales included the age of respondents (years), and the length of time that farmers had been members of a farmers group. Likert scales were used for data intervals - for example to measure the extent to which respondents were satisfied with an information service (Very satisfied 1 2 3 4 5 Satisfied), and numerical scale (ordinal or interval) (Sheppard 2004:71; Lewin 2005:222), to measure the cooperation of farmers in groups for example (Extremely favourable 5 4 3 2 1 Extremely unfavourable). The scales used shaped the statistical analysis performed on the data (Frankfort-Nachmias and Nachmias 1996:158; Durrheim and Painter 2006:157), and the analysed data generated the study findings and conclusions (Poole 2004:171).

## **5.7 Data analysis techniques**

Babbie and Mouton (2001) pointed out the need for combining different approaches to analysing data. As earlier noted, while quantitative results are persuasive and yielded results that were clear-cut and generalised (Firestone 1987), qualitative methods provide descriptive data which is rich, descriptive, explanatory gives meaning (Firestone 1987:19; Gray 2004:319), and provides for comparison. Miles and Huberman (1994:40) emphasised that both numbers and words helped to understand the world and qualitative methods added quality and flavour that was indisputable. In addition, qualitative data revealed unique variances that may otherwise have been missed out (Jick 1979:603); provided for comparison with quantified data (Miles and Huberman 1994:42); and allowed "the data to 'speak for themselves,'" without being tainted by interpretations (Gray 2004:319). Summarising the importance of qualitative data, Jick (1979:609) described qualitative data and analysis as "the glue that cements the interpretation of mutimethod results" (Jick 1979:602). Besides, a combination of qualitative and quantitative data analysis methods were deemed necessary for complex, multiple method research design studies (Miles and Huberman 1994:42).

Considering the complex conceptual framework of the present study and the use of multiple method research, a variety of complementary methods were used to analyse data (Shaughnessy, Zechmeister and Zechmeister 2003:361; Tashakkori and Teddlie 2003:232; Creswell and Plano Clark 2007:128). Data analysis entails coding or categorising the data and carrying out statistical calculations (Powell and Connaway 2004:89,230). There are several designs or strategies for data analysis including those

used by Greene, Caracelli and Graham (1998:270), where qualitative and quantitative data were analysed separately and not integrated hence independent interpretations were done; those analysed separately but with some data being integrated, and those integrated during analysis and interpretation. Tashakkori and Teddlie (2003:233) and Johnson and Christensen (2008:552) referred to sequential and concurrent data analysis designs. On the other hand, Teddlie and Tashakkori (2009:266-280) discussed several mixed data analysis strategies namely: parallel, where qualitative and quantitative data are analysed independently but may be combined in interpretation; and conversion, where qualitative data is converted and quantified or *vice versa*; sequential analysis; multilevel mixed data analysis where qualitative and quantitative techniques are combined at different stages of analysis to answer the research questions; and the fully integrated mixed data analysis strategy or design, whereby qualitative and quantitative data were mixed interactively with some qualitative data being transformed to quantitative and analysed statistically and *vice versa*.

Data analysis was in essence guided by the research question(s), and multiple levels of analysis were necessary for some questions (Creswell and Plano Clark 2007:131,136; Teddlie and Tashakkori 2009:279), for example at the level of individual farmers and farmers' groups in the case of the present study. As pointed out by Bergman (2008c:587), the "research question, data collection and data analysis are interconnected." As pointed out by Gray (2004:327), the decision on data analysis methods was also guided by the need to interpret, to understand and to explain. Multiple data sets were used in the present study (focus group discussions with farmers' groups, interviews with farmers belonging to a group, farmers not belonging to a group, NGOs and CBOs, government ministries, research and education institutions, PRA, RAAKS). Advantages for using multiple data sets in the same research include: i) verification of data from different sources; ii) convergence of data to ascertain quality and changes or differences across types of groups in different areas, which contribute to convergent and divergent validity; iii) complementarity which provides additional data and perspectives; and holism to provide an holistic picture of reality or observed phenomenon (Bergman 2008c:591-92).

Quantitative data was checked for completeness and errors, and pre-coded data was keyed into Excel and assigned numeric values while uncoded data was explored to determine the broad trends or themes. A codebook was established before the data was entered into a database in SPSS (Weinberg and Abramowitz 2008; Carver and Nash 2009). The data was then summarised numerically (Creswell and Plano Clark 2007:130). As the present study was predominantly qualitative, the quantitative data was used to supplement qualitative results.

Qualitative data was partially analysed using NVivo (Leedy and Ormrod 2005:158; Dean and Sharp 2006; Richards 2006; Cohen, Manion and Morrison 2007:77,156,283; Johnson and Christensen

2008:551). However, only a sample of the focus group discussions were transcribed into MS Word and imported into NVivo. This exploration of data helped to determine the emerging themes (Creswell and Plano Clark 2007:130). The broad themes were used to guide the researcher in coding the data (Powell 2003:199,247; Tashakkori and Teddlie 2003:232; Weinberg and Abramowitz 2008; Carver and Nash 2009). However, as pointed out by Powell and Connaway (2004:248), some data cannot be quantified. The purely qualitative data was analysed through content analysis, which entailed reducing the data into smaller units to reveal their special characteristics or categories (Jick 1979:606; Gray 2004:328). In the case of the present study, content analysis was initially carried out manually by exploring the response sheets to understand the data and make sense of the emerging trends and patterns through grounded theory. The responses were then keyed into Excel spreadsheets under broader categories on a daily basis as the data was collected. As emphasised by Gray (2004:327-328), understanding the data facilitated interpretation and making of inferences. The data was then analysed by summarising, clarifying and explaining unclear content (Gray 2004:328). Depending on the research question being answered. The data was organised, reduced, coded and keyed into SPSS and the categories identified guided further analysis of the data using SPSS.

Although NVivo was more appropriate, it was not used to analyse all the qualitative questions. The decision to use SPSS in place of NVivo for analysing qualitative data was guided by the volume of data from multiple data sets that needed to be transcribed and the amount of time and resources it would take to code the data in NVivo. Quotes from interviews and observation were used judiciously to authenticate and improve satisfactoriness of qualitative findings (Johnson and Turner 2003:342-344). Some qualitative data was transformed into numbers for statistical analysis where that approach best answered the research question (Bergman 2008c:590). In other words, some qualitative data was also analysed quantitatively.

Data from observation was analysed manually (qualitatively) on the text recorded on observation sheets by highlighting key words to observe the emerging themes and patterns. Although the researcher did not use software to analyse observation data, the thorough exploration and reading of the observation sheets helped the researcher to “maximise meaning” (Onwuegbuzie and Teddlie 2003:372). This understanding helped to consolidate the responses provided by participants and the data was used to complement and confirm findings from other methods. Analysis of qualitative data from the output the sense-making interviews and focus group discussions with farmers’ groups were systematically analysed through in-depth analysis of key issues (Dervin and anonymous students 1997), based on the Sense-Making methodology of situation, gap, bridge and outcome over space and time, and by focusing on the narrative of the interviews and the emerging themes (Foreman-Wernet 2005:3). Data from the RAKS and PRA methods were captured using the corresponding diagrams, maps and tables (Salomon and Engel 1997b; Kumar 2002), which were manually explored to observe

the emerging patterns and themes which guided interpretation. Visual displays help to organise and summarise information and add value to quantitative information, making it easier to understand and draw conclusions (Johnson and Turner 2003:337).

## **5.8 Reliability and validity**

Reliability and validity are used in connection with measurement of data, and influence what is learned about phenomenon being studied and the meaningfulness of conclusions drawn from data collected (Lewis and Ritchie 2003:270; Leady and Ormrod 2005:27). Although Sheppard (2004:242) posited that reliability and validity were frequently related to quantitative research, many authors (Duffy 1987:131; Firestone 1993:22; Cohen, Manion and Morrison 2007:133; Johnson and Christensen 2008:275) contended that reliability is not a preserve of quantitative research alone and that both qualitative and quantitative researchers seek reliable and valid results but use different approaches. For Lewis and Ritchie (2003:270), the concept reliability meant “sustainable” while validity denoted “well grounded.” However, in the opinion of Sheppard (2004:242), a qualitative researcher focuses more on valid data that represent a true picture of what is being investigated, while the quantitative researcher focuses heavily on reliability. On their part, Cohen, Manion and Morrison (2007:133,146,148) asserted that validity and reliability are a requirement for both qualitative and quantitative research, but acknowledged that the use of reliability under qualitative research has been contested by several authors.

Leady and Ormrod (2005:272) stated that there is no measure that has “perfect” validity and reliability. In support of this statement, Sheppard (2004:242) and Cohen, Manion and Morrison (2007:133) explained that it was not possible for research to be 100% valid because of in-built standard error in quantitative research and bias from subjectivity, opinions and attitudes under qualitative research. As pointed out by Wagenaar and Babbie (2001:66), trade-offs need to be made between validity and reliability to enhance quality measurements. Reliability and validity of data need to be maximised through the use of appropriate data collection techniques that yield information that is relevant to the research (relevance and correctness) (Mugenda and Mugenda 2003:95; Neuman 2006:188).

### **5.8.1 Reliability**

The goal of reliability in a study is to minimise errors and biases (Yin 1989:45). Reliability assesses the extent to which a test or procedure produces similar or consistent results on all occasions under constant conditions (Bell 1987:50-51; Kothari 2004:74; Sheppard 2004:79; Neuman 2006:188; Bovaird and Embretson 2009:278; Gravetter and Forzano 2009:82). It is essentially synonymous with replicability of research findings over time, instruments and groups of respondents (Cohen, Manion and Morrison 2000:117; Powell and Connaway 2004:43,47), and consistency (Cohen,

Manion and Morrison 2000:117; Cooper and Schindler 2003:236). According to Sheppard (2004:79), reliability has to do with how reliable the instruments are and the conditions under which the tool is used. Described differently, reliability has to do with stability, and assesses the results that would be yielded if a data collection tool was administered to the same individual on different occasions (Easterby-Smith, Thorpe and Lowe 2002:135), or coherence and repeatability in the outcomes (Beins 2004:106). In sum, reliability ensures that the instruments gather measurements that are consistent (Bovaird and Embretson 2009:281).

Cooper and Schindler (2003:236,238) posited that measures should possess stability and equivalence. In agreement with these authors, Beins (2004:106) asserted that measurements should be free of random or unstable error, while Neuman (2006:188) pointed out that errors could arise through inaccurate coding, ambiguous instructions, interviewer / interviewee fatigue and bias. Beins (2004:106) and Sheppard (2004:79) emphasised that data collection instruments should be robust, stable and consistent over time. Neuman (2006:188-190) advanced three types of reliability: i) representative reliability which deals with whether the indicator provides a similar response when applied to different groups or sub populations; ii) equivalence reliability which assesses whether the measure yields similar results across multiple indicators; and iii) stability reliability, which dwells on whether the measure present a uniform answer when applied in different time periods.

Reliability in quantitative research differs from that in qualitative research (Cohen, Manion and Morrison 2007:146). On the one hand, reliability in quantitative research is considered replicability, consistency and dependability over time, instruments and respondents (groups). It is also concerned with how precise and accurate the measurements are and ensure stability and consistency. On the other hand, reliability in qualitative research is considered debatable and while some authors have argued that qualitative research cannot be replicated or validated, others hold the thesis that reliability can be addressed by striving for accuracy in data reporting. Stability reliability in the present study was addressed through pre-testing of data collection instruments and the use of standard data collection instruments for different samples in the four divisions of Kirinyaga.

In this study, reliability was improved by having clearly defined constructs, using precise levels of measurement and using multiple indicators. Data collection instruments (questionnaire and interview guides and observation checklists) developed were pre-tested to ensure accuracy and consistency (Shaughnessy, Zechmeister and Zechmeister 2003:25). The protocol permitted the asking of the same questions to all respondents, in the same way they are worded, which ensured consistent responses (Frankfort-Nachmias and Nachmias 1996:240). The present study selected a large sample size to maximise reliability of data (Mugenda and Mugenda 2003:52), and reliability was increased through triangulation and the use of self-completed questionnaires, which encouraged greater honesty

(Cohen, Manion and Morrison 2007:148-149). As mentioned above under **section 5.8**, reliability and validity are used together and reliability contributes to validity (Cooper and Schindler 2003:237). Similar views were held by (Cohen, Manion and Morrison 2007:133), who asserted, “reliability is a necessary precondition of validity and validity may be a sufficient but not [a] necessary condition for reliability.”

### **5.8.2 Validity**

Validity assesses the accuracy, correctness or precision of whether measures attained for an attribute are what is supposed to be measured (Bell 1987:51; Leedy and Ormrod 2005:28; McBurney and White 2007:169,171; Bovaird and Embretson 2009:281; Gravetter and Forzano 2009:75). It therefore follows that since validity affects the quality of research, data gathered should be a true reflection of the variables (Powell and Connaway 2004:43; Gravetter and Forzano 2009:157). According to Shaughnessy, Zechmeister and Zechmeister (2003:25) validity denotes the “truthfulness” of a measure, or as described by Cook and Campbell (2004:48) is a measure of the best available approximation regarding whether propositions are true or false. Leedy and Ormrod (2005:92) viewed validity of instruments to be the extent to which the instrument measures what it is actually supposed to measure.

Indeed, as suggested by Neuman (2006:188), validity means truthfulness and refers to how well an idea “fits” with actual reality, or “trustworthiness” in qualitative research (Johnson and Christensen 2008:275). Neuman (2006:188) argued that validity measures how well the social reality being researched matches with the constructs researchers use to understand it. On the other hand, McBurney and White (2007:169,171) described validity as the extent to which the conclusions made by the researcher are accurate and trustworthy. Validity “corresponds to the actual state of the world” and is “an indication of accuracy in terms of the extent to which a research conclusion corresponds with reality.” They also pointed out that validity measures the “extent to which the results support the theory behind the research” (McBurney and White 2007:169,171). Emphasising the role of validity, Cohen, Manion and Morrison (2007:133) reiterated, “validity is an important key to effective research.” For Cohen, Manion and Morrison (2007:150) and Johnson and Christensen (2008:275), minimising the amount of bias (interviewer characteristics, respondent characteristics, content of questions) was a practical way of achieving high validity. Validity also entails demonstrating some correlations with other related variables (Bovaird and Embretson 2009:281), and with triangulating different methods of data collection (Hammersley 2008:23,31). For example, the present study used focus group discussions to provide complementary information and check interpretations and conclusions arrived upon based on individual interviews, PRA and RAAKS, which helped to minimise the chances of drawing false conclusions.

The present study used a large sample to ensure a representative sample at sub-location level from the target population (Kirinyaga district) (Mugenda and Mugenda 2003:10,52), and triangulated data collection methods (Beins 2004:174; Cohen, Manion and Morrison 2000:108,115), sources, investigators, theories, instruments (Cohen, Manion and Morrison 2000:108,115), and paradigms (Cohen, Manion and Morrison 2000:108,115; 2007:134). Further, validity was ascertained through careful development of questionnaires, interview guides and an observation checklist that were pre-tested and refined (Easterby-Smith, Thorpe and Lowe 2002:86; Cohen, Manion and Morrison 2007:150), through assuring respondents of anonymity and through training of translators (Davis, K. E. 2006). The study also addressed validity in quantitative data through careful sampling (Cohen, Manion and Morrison 2007:133); by adopting multiple sampling strategies (Creswell and Plano Clark 2007; Teddlie and Tashakkori (2009:178-180) and through the use of appropriate statistical treatments. In sum, the present study aimed at achieving high validity by minimising the amount of bias, by triangulating methods, investigators, sampling strategies, data collection and data analysis methods and by having a large sample.

However, Cooper and Schindler (2003:231) contended that it is challenging to satisfy the test of validity as often the researcher does not know the true differences without confirming knowledge. Specific threats to validity have thus been advanced to improve validity of data namely internal, external and construct validity (Easterby-Smith, Thorpe and Lowe 2002:53; Cooper and Schindler 2003:231), content validity, criterion-related validity and construct validity (Sekaran 2003:206; Durrheim and Painter 2006:147). Other types of validity include face, concurrent and predictive validity (Sheppard 2004:80), and statistical validity (McBurney and White 2007:173). The main threats to validity are discussed below.

#### **5.8.2.1 Construct validity**

Construct validity pertains to the accuracy of the instruments for data collection and how well the results measured fit the theories being tested (Durrheim and Painter 2006:151; Cohen, Manion and Morrison 2007:138; McBurney and White 2007:171; Gravetter and Forzano 2009:79). The researcher made predictions based on existing theoretical background and linked them to relationships in similar conditions (Sheppard 2004:80). Where the characteristics being measured were not being directly observed, they were inferred from the behaviours of farmers (Leedy and Ormrod 2005:92), for example satisfaction with information services. As suggested by Neuman (2006:194), and Johnson and Christensen (2008:272) the present study spelled out clear definitions for the conceptual boundaries. In addition, Johnson and Christensen (2008:273) pointed out that operationalisation as well as measuring constructs in different ways helps to address construct validity. The aspect of measurements was addressed in **section 5.6**.



According to McBurney and White (2007:176-177), threats to construct validity are caused by the relationship to theories. Construct validity is difficult to achieve because there may be many theories accounting for a relationship, and often, the researcher identifies the most plausible theory that supports the research by eliminating the less plausible alternatives. Two main areas that pose threats to construct validity include loose connection between theory and method and ambiguous effect of independent variables. The latter may occur where all the respondents do not understand the circumstances of the research in the same way, leading to ambiguity. The informants may also choose to act according to “what they think the researcher wants” instead of basing their actions on the purpose of the research, or they may change their behaviour to appear as “socially desirable,” because of participant expectancy, which leads to evaluation apprehension. In the present study, construct validity was addressed by presenting the operational definitions of variables (Beins 2004:128) such as information needs, information sources and information behaviour, by providing adequate coverage of questions in the measuring instruments and by triangulating sources of evidence. Furthermore, data collection instruments were also pre-tested. Multiple theories were used to address different facets of the study or objectives that best supported the specific study objectives and were linked to results to assess whether the results supported the theory(ies) guiding those components of the study (Durrheim and Painter 2006:151). Another type of validity was criterion-related validity.

#### **5.8.2.2 Criterion-related validity**

Criterion-related validity measures the extent to which the results of an assessment instrument are related to another related standard that compares the measures to ensure that the construct is accurately represented (Kothari 2004:74; Leedy and Ormrod 2005:92; Neuman 2006:193). As an example, a measure of a group with high work ethic values that is enthusiastic about work and are off welfare, and a group on welfare that does not have high work ethic values that is lethargic and does not want to work may use the same measure of work ethic (Sekaran 2003:207). There were two types of criterion-related validity, namely predictive and concurrent validity (Durrheim and Painter 2006:147; Cohen, Manion and Morrison (2007:140). The present study addressed criterion-related validity through triangulation of data collection methods and instruments including a questionnaire, observation, interviews and secondary data (Cohen, Manion and Morrison (2007:140,141), and including different types of farmers’ groups that were producing different enterprises under varied agroecological conditions.

#### **5.8.2.3 Internal validity**

Internal validity looks at the research design and how well it eliminates bias (Easterby-Smith, Thorpe and Lowe 2002:53). It pertains to the degree to which extraneous variables are controlled (Mugenda and Mugenda 2003:99-100-104; Johnson and Christensen 2008:257,279), and relates to the

confidence a researcher has with the research results (Sheppard 2004:123). Further it assesses the degree to which the independent variables interfere with the dependent variable (Beins 2004:132). Johnson and Christensen 2008:268:255) referred to this type of validity as “causal validity.” Internal validity applies to qualitative and quantitative research and examines the manner in which data obtained explains a particular issue or event (Cohen, Manion and Morrison 2007:135), and how “alternative plausible explanations” are excluded (Teddlie and Tashakkori 2009:297). Threats to internal validity include history, maturation, testing, instrumentation, statistical regression, selection, mortality or attrition, interactions with selection, ambiguity about the direction of causal influence and imitation of treatments (McBurney and White 2007:173-178; Teddlie and Tashakkori 2009:299). Addressing threats to internal validity entails guarding against confounding important variables with the independent variable, where confounding refers to the “error that occurs when the effects of two variables in an experiment cannot be separated, resulting in a confused interpretation of the results” (McBurney and White (2007:170,173-178). In the present study, internal validity threats were minimised by having two sets of farmers (belonging and not belonging to a group), where the farmers not belonging to a group acted as a control (Johnson and Christensen 2008:258-259).

#### **5.8.2.4 External validity**

External validity seeks to define the domains to which the study will be generalised beyond the context of the study (Easterby-Smith, Thorpe and Lowe 2002:53; Cohen, Manion and Morrison 2007:136; Johnson and Christensen 2008:267,281). External validity measures “how well the findings of ... generalize to other situations or populations” (McBurney and White 2007:172). In other words, external validity relates to how representative a sample is to the target population (Mugenda and Mugenda 2003:99-100-104; Beins 2004:134), and tests the extent to which similar results may be obtained at other times or in different settings. According to Mugenda and Mugenda (2003:107) and McBurney and White (2007:177-178), there are many threats to external validity, which make it difficult to generalise research findings to other situations. The present study factored in some of the major threats to external validity identified by various authors (Mugenda and Mugenda 2003:107-109; McBurney and White 2007:177-178; Johnson and Christensen 2008:267) by:

- i) using cluster sampling to ensure randomness and representativeness of the sample, and to ensure the accessible population and target population were similar (see **section 5.4**). For example, men and women and the youth may behave differently, hence the sample of the present study was chosen with respect to the categories in the larger population.
- ii) Controlling of extraneous variables to avoid confounding of effects of independent variables on the dependent variable;
- iii) pre-testing but not including the pre-test results in the results obtained from the sample;
- iv) defining variables conceptually and operationally to ensure good understanding and replication of the study in different divisions to enable generalisations.
- v) Research conducted at different times may present different

results, and as discussed above, historical trends and maturation effects may not bring forth similar results. In this regard, all the data was collected within the same period.

#### **5.8.2.5 Face validity**

Sekaran (2003:206) considered face validity to be a basic and minor index of content validity. Face validity focuses on expert judgement of the extent to which the instrument measures key dimensions of what they theoretically represent (Sheppard 2004:80,81; Gravetter and Forzano 2009:76).

According to Neuman (2006:192), face validity is the most basic kind of validity and the easiest to achieve, as the indicator used is the “judgement by the scientific community.” Face validity in the present study was addressed by having some structured interviews with a uniform format and sequence. The study also improved face validity by pre-testing the data collection instruments to minimise bias and to ensure that the questions on the instruments measured the “true value” of the variable (Cohen, Manion and Morrison 2007:150).

#### **5.8.2.6 Content validity**

Content validity measures the extent to which a data collection instrument reflects the content domain in appropriate proportions, ideas or areas in the conceptual domain (Leedy and Ormrod 2005:92; Neuman 2006:193). The present study addressed content validity by using data collection instruments that were fairly detailed and comprehensive, and encompassing the key areas covered in the research questions. Content validity was also addressed by providing definitions of key concepts and constructs that were studied (Neuman 2006:193). Sampling was also carefully carried out to ensure a representative sample using a triangulation of probability and non-probability sampling methods (Cohen, Manion and Morrison 2007:137).

#### **5.8.2.7 Statistical validity**

McBurney and White (2007:170,173) referred to statistical validity, which resembles internal validity, but in essence measures the extent to which data shown results from cause-effect relationships between independent and dependent variables, as opposed to pure chance. Statistical validity is measured using inferential statistics. Improper use of statistics during data analysis may give rise to threats to statistical validity, and results obtained may suggest erroneous conclusions. In addition, McBurney and White (2007:178-179) pointed out that it would not be appropriate to make conclusions from too few participants or observations.

#### **5.8.2.8 Other threats to validity**

Other types of validity include: concurrent validity, which pertains to correlation of scores with conditions that are external; predictive validity, which centres on the capacity of the data collection instrument(s) to measure what it was expected to measure (Sheppard 2004:80,81). For example it could be stated that women with good access to agricultural knowledge and information will attain

higher productivity than men. Other authors referred to population validity; convergent and divergent validity; and validity of information. Validity of information under the participatory research methods (RAAKS and PRA) were established by involving users at various levels (community members to managers) in interpreting the information (Narayan 1996:19). In ensuring “population validity,” (Mugenda and Mugenda 2003:10; Johnson and Christensen 2008:269) cautioned against the use of an accessible population and argued that this was likely to lead to loss of generalisability of results. Mugenda and Mugenda (2003:10) pointed out that the target population and accessible population need to be comparable (see **section 5.4.1**). Elsewhere Beins (2004:131) and Neuman (2006:194) referred to convergent and divergent (discriminant) validity, where convergent validity was attained where results of multiple indicators of one construct were similar or were associated with one another. Divergent validity measures the degree to which two measurements that should be unrelated yield different values. Johnson and Christensen (2008:270-271,277-278) pointed out other threats to validity including descriptive, interpretive, theoretical, ecological, temporal and outcome validity.

## **5.9 Ethical considerations**

Ethical issues arise throughout the research process from the nature of the problem being investigated, the data being collected and from the data collection methods (Shaughnessy, Zechmeister and Zechmeister 2003:45; Beins 2004:204; Cohen, Manion and Morrison 2007:51; Gravetter and Forzano 2009:98; Teddlie and Tashakkori 2009:199). Peil and Rimmer (1995:16) argued that in carrying out “good science,” scientists face challenges with gaining access, obtaining informed consent and ensuring that the effects after the research do not damage the individual(s) or the community. Many authors observed that “good science requires good scientists,” thus attaining integrity in the research process, honesty and respectfulness of researchers to participants and the community is the responsibility of individual researchers (Shaughnessy, Zechmeister and Zechmeister 2003:45; Gravetter and Forzano 2009:98; Teddlie and Tashakkori 2009:199). Cooper and Schindler (2003:120) defined ethics as “norms or standards of behaviour that guide moral choices about our behaviour or our relationships with others,” and guide against harm or adverse consequences from research activities. Sekaran 2003:17,18 equated ethics to “a code of conduct or expected societal norm of behaviour while conducting research” and pointed out that ethical conduct applied to the researcher, participant, sponsor and the analyst. Emphasising the importance of research ethics, Beins (2004:204) asserted that all research calls for ethical behaviour on the part of the researcher. However, it was observed that ethics is not as well developed in the social sciences as it is in the biomedical sciences (Wassenaar 2006:77). As emphasised by Cohen, Manion and Morrison (2007:58), the researcher “must take into account the effects of the research on participants.” In addition, researchers need to establish a relationship of trust with the study participants (Fisher and Anushko 2009:97).

Failure to adhere to ethical standards could undermine the entire research process and may result in painful legal or financial consequences (Shaughnessy, Zechmeister and Zechmeister 2003:45). Thus, adhering to research ethics ensures integrity in research (Cooper and Schindler 2003:121) and “enhances the value of research” (Wassenaar 2006:77). Beins (2004:29) noted that there was still a realisation of “shameful episodes of unethical research practices” in the 20<sup>th</sup> Century. This revelation led to increasing concern over ethical issues in research and a recommendation for the development of systematic and verifiable knowledge (Frankfort-Nachmias and Nachmias 1996:77), while at the same time taking into consideration the well being of research informants (Beins 2004:29; Teddlie and Tashakkori 2009:198).

Ethics committees have been established to review research (Wassenaar 2006:63; UKZN 2007) and professional ethical codes of ethics and standards have been formulated to assist members of specific associations or professions. Examples include the code of ethics for social scientists that highlight the decision to conduct the research, informed consent, provision of information, voluntary consent, protection of rights and welfare of participants, deception, confidentiality and anonymity, benefits to participants, effects on communities and interpretations and reporting of research results (Frankfort-Nachmias and Nachmias 1996:90-95). Another example is the ethical guidelines and principles drawn up by the UKZN (2007) that provides guidance to authors and researchers regarding what is required and problems to avoid. The UKZN has also set up an ethics committee that ensures research proposals address ethical issues. In this regard, the proposal for the present research was cleared by the UKZN research committee. The essence of adhering to ethical standards is to ensure that the researcher stands out as a professional “with standards for ethical conduct,” in the relationship between the research, researcher and participants (Lindorff 2007:21).

Following the recommendation of most text books that informed consent be obtained from all persons and groups interviewed (Leedy and Ormrod 2005:101; Cohen, Manion and Morrison 2007:52; Gravetter and Forzano 2009:107-108; Hesse-Biber 2010:56), consent of respondents was secured by writing to participants, disclosing the full procedure of the study, and obtaining their permission (see **Appendix 5**). In addition, many authors (Shaughnessy, Zechmeister and Zechmeister 2003:46-63; Teddlie and Tashakkori 2009:199) recommended the need to take into consideration issues of institutional approval, risk and benefit, debriefing, maintaining anonymity and confidentiality, deception through withholding information or misinforming research informants and plagiarism. In the case of the present study, approval was obtained from the GoK and the DC of Kirinyaga district (see **Appendix 6** and **Appendix 7**), and clearance was sought in all the divisions and sub-divisions in Kirinyaga. Questionnaire respondents and interviewees were briefed on the purpose, objectives and expected outputs of the study (Teddlie and Tashakkori 2009:201).

According to Frankfort-Nachmias and Nachmias (1996:86) invasion of privacy is a matter “of great concern.” Privacy was described as the right of a respondent to refuse to be interviewed or answer any particular question(s) they choose not to, not admitting interviewers, not answering phones and not having the fear of being observed (Cooper and Schindler 2003:126). In the present study, the right to privacy of the research participants or informants was attained by informing participants of their right not to participate in the study and not to answer any questions they chose not to, and by letting respondents choose the time and venue of interview (Frankfort-Nachmias and Nachmias 1996:86), and respecting their decision to refuse to participate or answer questions (Cohen, Manion and Morrison 2007:63-64). Confidentiality and anonymity were observed at all times, and this was attained by coding the identities of respondents, and not disclosing their identities (Leedy and Ormrod 2005:101; Cohen, Manion and Morrison 2007:65; Gravetter and Forzano 2009:113).

Although addressing the “ethical dilemma” is considered subjective, this research aimed at striking a balance between the rights of the participants and those of the researcher to acquire knowledge through weighing the benefits of the research against the opportunity cost to the participants (Frankfort-Nachmias and Nachmias 1996:77). As suggested by Piper and Simons (2005:57), informants were treated “fairly and equally,” and the UKZN ethical clearance codes and standards were adhered to at all levels. Some critics maintain that since researchers initiate the ethics process, the participants do not gain much in terms of direct improved welfare or accruals from the research (Lindorff 2007:27). Teddlie and Tashakkori (2009:201) recommended the need to debrief informants of the study to share the research findings and accord them an opportunity to learn and to provide feedback. In this regard, the researcher plans to hold a debriefing workshop for the study participants in Kirinyaga district, and representatives of key stakeholders in Kenya. This study also took into consideration the findings of Naimi (2007:29) who notes the problems with internet plagiarism in educational institutions, and adhered to the UKZN ethics policy.

## **5.10 Summary**

This Chapter focused on the research methodology, research design and primary and secondary methods of collecting data to understand small-scale farmers as key actors in supporting agricultural development and linkages between key actors in Kirinyaga district. The Chapter provided details on the study population, sample, sampling techniques, the research design, data collection instruments, measurement of variables and data analysis design and techniques. Data collection focused on the information needs and behaviour of small-scale farmers, their sources of agricultural information and knowledge, linkages and flows of knowledge and information (including communication media and ICTs), usage of these resources and barriers to accessing knowledge and information, as well as existing knowledge management and information management practices.

# CHAPTER SIX: INTRODUCTION TO DATA PRESENTATION AND INTERPRETATION, AND SOCIO-DEMOGRAPHIC CHARACTERISTICS OF SMALL-SCALE FARMERS AND FARMERS' GROUPS

## 6.0 Introduction

Chapters six to twelve present empirical data collected through qualitative, quantitative and participatory methods in Kirinyaga district, and interpret the findings in the context of the results, the research questions under each objective and the theoretical framework and literature reviewed in **Chapter four**. Various authors (Mauch and Park 2003; Neuman 2006:473; Wolcott 2009:29) have suggested the separation of data presentation and interpretation (Wolcott 2009:29) to enable readers to separate the “scientific” from the “humanistic” face of research, and make independent sense of what the data reflects. However, Wolcott (2009:32) also pointed out that the decision to set the data and interpretation apart or meld interpretation into the analysis depended on the strategy, style and experience of the researcher. Wolcott (2009) argued that “there is no such thing as pure description,” and suggested that separating the description of the research, presentation of data and interpretation was a “matter of emphasis.” Wolcott (2009:33) emphasised the need for having distinct headings for data presentation and interpretation where the two are combined. Because of the multiple method research design, and the nature of the study of AKIS, which was broad with triangulation of paradigms, theories, methodologies and methods, the researcher combined the data presentation, analysis and interpretation in the same chapters but under distinct sections to make it easier for the reader to follow. Data interpretation is presented in a different colour to distinguish the section from data presentation.

Wolcott (2009:26) advised on a brief coverage of the nature of the study, how it was conducted, the period the research was conducted, extent of involvement, whether the researcher resided at the study site and triangulation. The aim of the study was to understand small-scale farmers as key actors in supporting agricultural development and linkages between key actors (especially farmers' groups), their information behaviour, sources of information and knowledge, linkages and flows of information (including the role of ICTs), usage of these resources and barriers to accessing knowledge and information. This study also investigated the existing knowledge management and information management practices and proposed an AKIS model for small-scale farmers in Kirinyaga district *a posteriori*. The objectives of the study (see **section 1.4**) and the research design (see **section 5.3**) remained constant throughout the study, with minor adjustments to the sample sizes.

Mouton and Marais (1996:192-193) state that research findings should be described fully showing the way the study was planned, structured, executed, its relevance and representativeness of the sources of data. In short, primary data was collected through participatory approaches using selected

windows of the RAAKS and PRA methods, survey method, focus group discussions, and observation (see **section 5.5.1**). Qualitative and quantitative data was collected, cleaned, edited, and checked for completeness and errors (Cooper and Schindler 2003:454-471) (see **section 5.7**). Because of the complex conceptual framework adopted in this study, data was analysed using multiple methods to provide a variety of findings (Mouton and Marais 1996:193). A sample of qualitative data was transcribed, keyed in MS Word and imported and coded using NVivo 8.0 software to establish the emerging patterns and themes, and to guide coding of qualitative data in SPSS. Quantitative and qualitative data was coded, keyed in and analysed using SPSS. Data from the PRA and RAAKS methods was analysed through drawings and images. These multiple sources of data are presented in the form of drawings, images, tables, figures and narration boxes and quotes under major themes in response to the subsequent research questions under each objective (see **section 1.4**). The data collection instruments are presented in **Appendix 9** to **Appendix 17**.

Where sources or items were ranked, the top three are emphasised, and although farmers' groups were not among the first three sources, their results have been highlighted, as they are a key focus in this study. Subsequent items are listed chronologically according to their percentages in descending order. In the context of this study, "farmers" refer to small-scale farmers belonging to a group, those not belonging to a group and farmers' groups. The term "individual farmers" is used to refer to farmers belonging and not belonging to a group. Pseudonyms are used in place of real names for the PRA participants to ensure confidentiality and anonymity.

## **6.1 The data collection and analysis process**

Data collection took place over a period of four months between July and October 2008. During this period, the researcher lived in Kirinyaga district to be able to observe the daily activities and interactions between different actors. Living amongst the community helped to better understand the community being studied (see itinerary in **Appendix 18**). The interview guides for individual farmers and for focus group discussions were translated into Kiswahili (see **section 5.5.1.5**). Unfortunately, the data collection period coincided with the rainy season, and on some days the rains were very heavy, resulting in a low turnout of farmers. As a result, some focus group discussions scheduled for Ndia division did not take place due to lack of quorum (minimum number of people who made a focus group was four (Krueger and Casey 2000:10) (see **section 5.5.1.3.1.2**).

### **6.1.1 Research assistants**

Following the advice of the DAO in Kirinyaga district, the researcher used local research assistants, who knew the area well and could gain easy entry into the rural communities. Fieldwork in Kirinyaga district and Nairobi took four months. This long period for data collection provided sufficient time to clarify issues with research assistants, carry out preliminary editing and cleaning of



information on completed questionnaires and interview responses while still within each sub-location. Twenty nine (29) research assistants helped with data collection. Of these, nine (three male and six female) helped in Central, seven (two male and five female) in Gichugu, seven (five male and two female) in Mwea and five (two male and three female) in Ndia. Two research assistants worked alongside the researcher in all four divisions. The research assistants comprised divisional and field extension officers (FEOs), one agricultural undergraduate student on internship, and one community development officer.

### **6.1.2 The sampling process / procedure**

The sampling process was described in **section 5.4.2.4**. Nine sub-locations were identified in each division using cluster sampling (see **section 5.4.2.4.1** and **Appendix 19** to **Appendix 21**). Although the number of locations and sub-locations in the district had increased by the time the researcher was gathering data following restructuring by the Government, data was collected using the old groupings of locations and sub-locations. The interviews for individual farmers (see **Appendix 11** and **Appendix 12**) and for focus group discussions (see **Appendix 10**) were conducted in English, Kiswahili or Kikuyu (the local language spoken by the community in Kirinyaga), based on the interviewees language preference.

### **6.1.3 Informants<sup>57</sup> of the study**

**Table 1** below summarises the informants of this study while **Appendix 19** presents the total number of focus groups per division, location and sub-location. The demographic data in Kenya depicts 49.2% male and 50.8% female in poor households and 49.4% male and 50.6% female in non poor households (RoK. KNBS 2008b:17). However, despite the efforts made to include equal numbers of males and females in the study, the turnout of males was higher than females, leading to a male: female ratio of 3:2.

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<sup>57</sup> Under the Sense-Making methodology and Sense-making theory, providers of information and users were not viewed as research subjects or respondents but rather as informants who were dialogic partners in sense making and unmaking over time and space. The terms informants and participants are therefore used.

**Table 1: Informants of the study**

Informants	Number of / informants (N)	Gender	
		Male	Female
Focus group discussions (farmers' groups)	90		
<sup>58</sup> Individual farmers belonging to a farmers' group	102	59.8%	40.2%
<sup>59</sup> Individual farmers not belonging to a farmers' group	71	60.6%	39.4%
Government of Kenya (GoK) organisations, research, education and training institutions	14		
Key informants	4		
NGOs, CBOs, projects and religious organisations	8		
Input stockists (Agrovets)	27		
Information providers	4 (response rate 50%)		

#### 6.1.4 Data analysis, presentation and interpretation

The study was mainly descriptive in nature and data analysis focused on the informants who responded and not on the non-responses. This enabled the researcher to gain a deeper understanding of the population under study. There were many complex data sets with multiple response sets and a few interrelationships of variables. Descriptive statistics especially percentages, means, frequencies and cross tabulations were applied to the large mass of data. As pointed out by Chatfield (1988:22) and Corty (2007:27), descriptive statistics help to establish patterns and trends and to summarise and describe data. Data is presented by summing the responses in form of tables and figures. The sample size is therefore not constant for all questions and N is used to indicate the value of the number of informants who responded. Data presented is discussed in relation to previous findings as reviewed in Chapter four. Chapter six summarises and interprets the results on the socio-demographic characteristics of small-scale farmers and farmers' groups as well as the objectives and main enterprises of farmers. Chapter seven investigates and interprets findings on objective one, on the information behaviour of small-scale farmers with emphasis on their needs, seeking behaviour, sharing of information and knowledge and the integration of external agricultural information and local knowledge. Chapter eight identifies the major sources of external agricultural information and knowledge, criteria used to determine key sources, quality of information, users of the information and knowledge as well as the AKIS of small-scale farmers and the key features of the system. Chapter nine establishes the linkages and flows of information between actors and the channels of

<sup>58</sup> Individual farmers belonging to a group were selected from among the group members and they were interviewed individually to allow them the freedom to express their personal views, feelings, emotions and perceptions.

<sup>59</sup> Individual farmers not belonging to a group were farmers who had not registered in any group and these were selected from the surrounding community to find out whether their information behaviour and sources of information were different from those in groups.

communication, with emphasis on ICTs used for sharing and exchanging information and knowledge. Chapter ten assesses the usage of information and knowledge and identifies the different types of information and knowledge used, the frequency of use, and the decision making processes of small-scale farmers. The chapter further establishes the sufficiency or non sufficiency of knowledge and information in the AKIS and the barriers and constraints encountered in accessing and sharing information and knowledge. Chapter eleven presents and discusses the current practices in information management and knowledge management in Kirinyaga district. Finally, Chapter twelve presents findings on suggestions for an AKIS model, and proposes a model for small-scale farmers in Kirinyaga district.

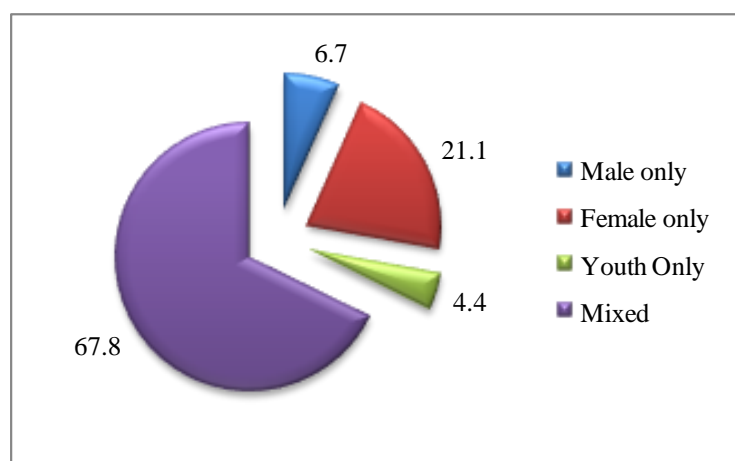
## **6.2 Socio-demographic characteristics of small-scale farmers and farmers' groups**

This Chapter provides background socio-demographic information and aims to answer part of the **research question 1.3: *Which farmers' groups are in place in Kirinyaga district? What are their characteristics and what roles do they play in facilitating the exchange and sharing of knowledge and information?***, under research objective one. The Chapter presents, discusses and interprets findings on the types of farmers' groups, geographical location of informants, status of farmers' groups and registration, age and gender of individual small-scale farmers, their level of education and objectives of farmers' groups and individual farmers. Chapter six further discusses findings on the main sources of food and income of small-scale farmers, the establishment of farmers' groups, selection of group leaders and responsibilities of leaders and members, as well as the main enterprises produced by small-scale farmers. Data corresponding to the research question 1.3 under objective one was collected through interviews with farmers, key informants, representatives of relevant government ministries, research, training and education institutions, NGOs, CBOs and projects. Additional data was collected through focus group discussions with farmers' groups, observation, PRA and questionnaires completed by information providers (see **section 5.5**). Although the socio-demographic and characteristics of farmers' groups and individual farmer informants were not included in the study objectives, this data is presented, analysed and interpreted to provide a background on the small-scale farmers and farmers' groups in Kirinyaga district, Kenya and some relationships of other variables.

### **6.2.1 Type of groups**

Ninety (90) focus group discussions were held with small-scale farmers' groups in four divisions of Kirinyaga district. In Central division, 22 (24.2%) focus group discussions were held, while the figures for Gichugu and Mwea divisions were 26 (28.9% each) and 16 (17.8%) in Ndia. Of the 90 groups, 61 (67.8%) were mixed groups, while 19 (21.1%) were female only, six (6.7%) were male only, and 4 (4.4%) were youth only groups (see **Figure 5**). This data was corroborated by data from individual farmers belonging to groups (N=102), where 69.3% of the informants indicated they were enrolled in mixed groups, 17.8% in female only groups, 10.9% in male only groups and 2.0% in youth

only groups. The composition of mixed groups comprised males, females, and youths. Most of the individual farmers interviewed belonged to more than one group, with some being members of up to three groups.



**Figure 5: Types of farmers' groups represented in the study**

N=90

### 6.2.2 Geographical location of informants (division, location, sub-location)

Focus group discussions, interviews, PRAs, RAAKS exercises and observation were conducted in the four divisions (Central, Gichugu, Mwea and Ndia), 12 locations and 36 sub-locations (see **Appendix 19** to **Appendix 21**).

### 6.2.3 Status of small-scale farmers' groups and registration

Most groups (N=90) (88, 97.8%) were farmers' groups, while 2 (2.2%) had the status of cooperatives. The groups were diverse with some being formal (registered) and others informal (not registered but recognised by the community). Eighty three (83, 92.2%) of the groups were registered with the Ministry of Gender, Children and Social Services or the Registrar of Societies. This registration enabled them to exist in their own right as legal entities that could transact business, open bank accounts, negotiate agreements, sue and be sued as well as apply for loans and access government or project support. Seven other groups (7.8%) were newly established and had plans to register once they were organised.

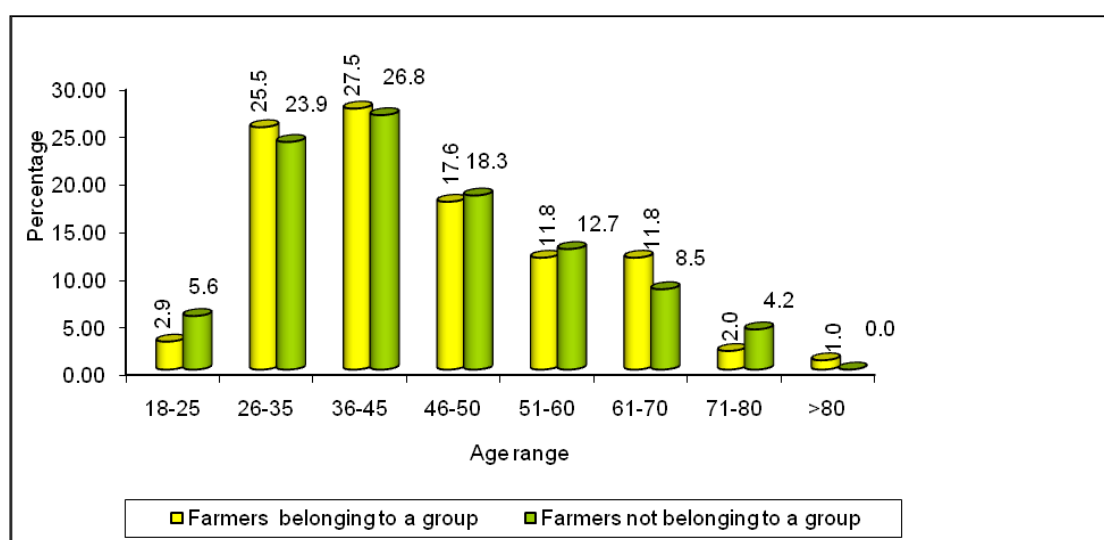
This study identified four types of farmers' groups in Kirinyaga district. While most groups were formal (legally constituted), others were informal. Most groups had the status of farmers' groups, while a few were cooperatives. By comparison, Madukwe (2006) identified the existence of cooperatives, farmer associations or groups, multi-purpose groups and national farmers' organisations. The World Bank (2009a:64) distinguished cooperatives, farmer research groups,

producer and self help groups, and user groups for NRM, extension and field schools, and “merry-go-rounds.”

The findings of the present study on types of farmers’ groups matched Bachmann’s (2000:14) who found that farmers in Fiji were mainly organised in cooperatives, unions and other operational groups. In Kenya, many self-help groups emerged post independence as a form of social capital in response to the “Harambee motto” of pulling (working) together to achieve common goals (Rees *et al.* 2000:2; Davis 2004:89-90). The subsequent requirement by government departments and other actors for farmers to form groups in order to access services such as training and extension, credit and funding or government / project assistance further led to the rapid rise in the establishment of formal and informal groups. The finding of the present study on farmers belonging to up to three groups confirmed the trend of working collectively. These groups yielded social capital that was regarded partially as a public good, hence when a member of the group learned about something new such as an innovation or technology, the information was shared with other group members. For Gotschi, Njuki and Delve (2009:275) farmers groups yielded social capital that facilitated the sharing of knowledge and information. Pretty (2008:179) observed that the social norms and bonds between group members were essential for sustainability and livelihood.

#### 6.2.4 Age and gender

The ages of the small-scale farmer informants varied between the age brackets of 18–25 and more than (>) 80. There were no significant age differences between the categories of farmers belonging to a group (M=102) and those not belonging (N=71) (see **Figure 6**). As shown in **section 6.4.3**, the oldest group member was 95 years old.



**Figure 6: Ages of individual small-scale farmers (belonging / not belonging to a group)**

N=102 farmers belonging to a farmers’ group, N=71 farmers not belonging to a farmers’ group

A large proportion (72, 70.6% of the farmers belonging to a farmers' group and 49, 69% of farmers not belonging to a group) were between 26-50 years, while 15 (26.6%) of farmers belonging to a group and 18 (25.4%) of farmers not belonging to a group were above 50 years. Very few (3, 2.9% of farmers belonging to a group and 4 (5.6%) of farmers not belonging to a group) were between 18-25 years. **Appendix 22** depicts a low number of youth in farming activities.

Data from focus group discussions (N=90) showed that the sample studied in Central, Gichugu and Ndia divisions did not have any representation in the age category of 18-35 years. In the category of farmers not belonging to a group, Gichugu had more individuals between 18-35 years than the other three divisions and of the 21 informants falling in the age category of less than 35 years, about half (10) of the informants were from Gichugu. Twelve of the 32 farmers in the age bracket of 36-50 years were from Gichugu. Most of the informants from Mwea were between 36-50 years, while Ndia had more representation in the age category of 36-45 years (see **Appendix 23**).

Linked to the age of farmers was gender. The study sample had more male informants than females in the two categories of small-scale farmers. Sixty one (61, 59.8%) of the farmers belonging to a farmers' group (N=102) were male, while 41 (40.2%) were female. The figures for farmers not belonging to a group (N=71) were 43 (60.6%) males and 28 (39.4%) females respectively. However, the issue of proportion of males to females is discussed further under the section on group size and composition (see **section 6.4.2**).

The head of the household is often associated with the person who makes the most important decisions within the household. However, in practice, this person may not necessarily be the main provider of household needs (RoK. KNBS 2008b:23). Farmers belonging to a group (N=102) were asked whether they were heads of their households and 75 (73.5%) answered yes while 27 (26.5%) answered no. The number of male headed households was higher than female headed households (77.5% versus 22.5%), with Gichugu division having the highest number of male headed households (17), followed by Mwea (16), then Central and Ndia (12 each) (see **Appendix 24**). In the case of farmers not belonging to a group (N=71), 48 informants (67.6%) indicated that they were heads of their households while 23 (32.4%) were not. Thirty-eight (79.2%) of the 48 informants were male while 10 (20.8%) were female. There were more male-headed households in Gichugu division (15), followed by Central and Ndia (10 each) and finally Mwea (3).

A comparison of figures for household headship showed that there were more male-headed households (93.4%) in the category of farmers belonging to a group than those not belonging to a group (88.4%). These figures were comparable to those obtained by the RoK. KNBS (2008b:40), which indicated that there were 83.9% male headed and 16.1% female headed households among the

category of the poor households and 81.2% male headed and 18.8% female headed among the non poor category in Kirinyaga district.

The findings of the present study on ages of small-scale farmers were similar to those established in most African countries in related studies. The ages of farmers fell between 18 and over 80 years, with the majority of farmers being between 26 and 70 years old. These figures were comparable to the national statistics that showed that the active labour force population in Kenya was between 15-64 years (RoK. Ministry of Finance and Planning 2002a:24). By comparison, Davis (2004:88) found that in Meru district, Central province, Kenya, 11% of the farmers were below 30 years, 43% were between 30 and 50 years while 46% were more than 50 years old. On the other hand, Okello, Okello and Ofwona-Adera (2010:8) found that farmers in Western province, Kenya were between 18 to 85 years old. The Government of Kenya statistics indicated that the young (0-24 years) people accounted for 64% of the country's population, and the age bracket 15-24 comprised 22.9% of the population (RoK. KNBS 2008b:18). Mapping the national statistics figures to the study findings imply that the low (2.9% of farmers belonging to a group and 7% of farmers not belonging to a group) proportion of young people engaged in farming activities could be detrimental to the attainment of goals and objectives set in the MDG, Vision 2030 and other national agricultural plans in the agricultural and related sectors.

Turning from the Kenyan context, Kiondo's (1998:199) study in Tanzania showed that the majority (70.34%) of rural women were between 26-55 years, while Mihale *et al.* (2009:252) found that the ages of farmers around Lake Victoria basin in Tanzania ranged between 20-75 years old. In South Africa, most rural farmers were elderly or women with young children (Meyer 2000:147). In Uganda, Byamugisha *et al.* (2008:96) established a similar trend among urban farmers, where more than half the informants were above 45 years, 30% were between 31 and 45 years, while 20% were between 18 and 30 years. In comparison, in a developed country context, Meert *et al.* (2005:87) established that most farmers in Belgium were more than 50 years old.

The findings of the present study depicting low numbers of youth farmers were corroborated in other African countries (Aina 2007:2), in Asia (Sambodo 2007:160; Man 2009:11) and Eastern Europe (Mishev and Kostov 2004:11). Aina (2007:2) showed that most of the farmers in Africa were growing old while the youth were migrating to urban cities, and in Nigeria, Okorie *et al.* (2009:87) found that 27.8% of the youth were migrating from farming activities in rural areas to engage in car wash businesses. In Bulgaria, a country in transition, Mishev and Kostov (2004:11) reported that the agricultural sector was dominated by older people and most young people were not keen to take up farming. Their main reason for shying away from agricultural activities was poor market opportunities and low returns on investment. With regard to emerging economies such as Malaysia, Man (2009:11) established that 0.4% of the farmers were less than 24 years of age. The findings of

the present study and those of other authors in Africa, Europe and Asia suggested a need to develop attractive age stratified information packages that in particular match the needs of the youth category of farmers. An area for further research would be to study the information behaviour of the youthful farmers.

The threat to the sustainability of the agricultural sector observed in the present study due to the low proportion of young people engaged in agriculture is also a serious challenge to other countries. These findings suggested the need to develop policies to provide the impetus needed to invest in youth to ensure that there would be “farmers of tomorrow.” Attaining the required levels of investment calls for i) deliberate action on the part of the government and other agricultural actors to sensitise and motivate the youth to adopt farming as a business. ii) Linking the findings to the human resources figures (see **section 2.2.4.4**), which showed a decline in the number of students enrolling for agricultural degree courses and a misfit of the curricula in terms of meeting the needs of the agricultural sector and industry, and taking necessary action. There is a need to harmonise the curricula with current agricultural practices and the needs of the industry, as well as to motivate more students to enrol in agriculture.

Although the study sample had more male than female informants in the two categories of small-scale farmers, the national distribution of households by gender indicate that there are more females than males (42.2% male and 50.8% female among the poor households category, and 49.4% male and 50.6% female among the non poor category). The figures for Kirinyaga district were comparable, and differed very slightly (45.8% male and 54.2% female among the poor category and 49.1% male and 50.9% among the non poor households category) (RoK. KNBS 2008b:17,30). Despite the figures for female farmers outnumbering males, and the great contribution of women to development, the efforts of women went unrecognised (RoK. Ministry of Finance and Planning 2002a:27). Many authors have shown that women did most of the work on the farms (Dixon 1982:561; Nederlof and Dangbégnon 2007:374), but they were “invisible in the information transfer process” (Leckie 1996:298; Trauger 2001:66). Women were the least empowered members of the rural community (IFAD 2002b:46), and were not involved in major decisions in relation to farming (Kabutha 1998:223; Kiondo 1998:243-244; Ndubi 1998:111). Yet, as demonstrated by Adendorff’s training programme in South Africa, some women in the groups were among those who emerged as better farmers (Meyer 2000:176). The lower participation of female farmers in the present study was likely to be because of the many household chores and activities they had to carry out on the farm. The findings of the present study and those of other authors (Leckie 1996:319; Trauger 2001:66) suggest a need for devising gender sensitive strategies that respond to the information seeking behaviour of farmers, with special focus on female farmers.

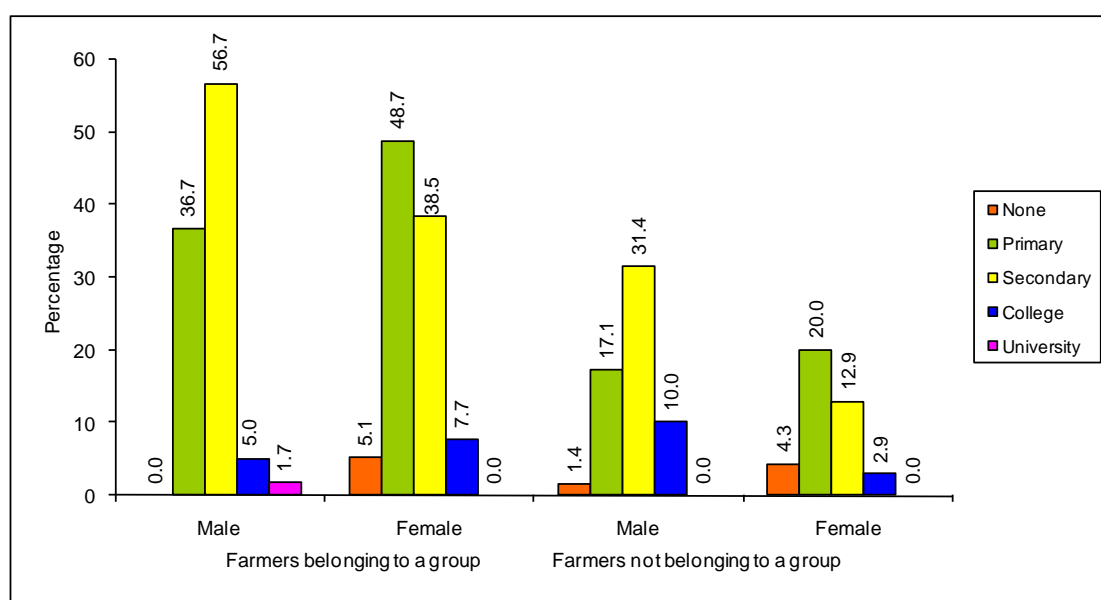


### 6.2.5 Education level

**Table 2** and **Table 3** display data on the education levels of small-scale farmers by division. Data collected from 99 small-scale farmers belonging to a group and 70 small-scale farmers not belonging to a group demonstrated that small-scale farmers in Kirinyaga district were fairly well educated and the majority could read and write. Only two (2.0%) of the farmers belonging to a farmers' group were illiterate. Approximately half (49.5%) of the farmers belonging to a group had secondary school education, 41.4% had primary school education, 6.1% had college education and 1.0% had a degree (see **Table 2** below).

More than half (56.8%) of the male informants had attained secondary school education and 48.7% of the females had attained primary school education. In the case of small-scale farmers not belonging to a group, 4 informants (5.7%) had not attained formal education, while 26 (37.1%) had attained primary school education, 31 (44.3%) had secondary school education, and 9 (12.9%) had college education (see **Table 3** below).

There were more informants in the category of female farmers belonging to a group than not belonging to a group who had attained primary, secondary school, college and university level education. In comparison, more male farmers (56.7%) than female farmers (38.5%) had attained secondary education (see **Figure 7**).



**Figure 7: Level of education of small-scale farmers in Kirinyaga district**

N=102 farmers belonging to a farmers' group, N=71 farmers not belonging to a farmers' group

**Table 2: Socio-demographic characteristics of farmers belonging to a group**

N=102

	Central division	Gichugu division	Mwea division	Ndia division	Kirinyaga district
Informants	20 (19.6%)	26 (25.5%)	32 (31.4%)	24 (23.5%)	102 (100%)
Gender	Male 13 (12.75%) Female 7 (35.00%)	Male 18 (17.65%) Female 8 (6.86%)	Male 17 (16.67%) Female 15 (7.84%)	Male 13 (12.75%) Female 11 (14.71%)	Male 61 (59.80%) Female 41 (40.20%)
Age					
< 25	0 (0%)	1 (0.98%)	1 (0.98%)	1 (0.98%)	3 (2.94%)
26 – 50	11 (10.78%)	21 (20.59%)	25 (24.51%)	15 (14.71%)	72 (70.59%)
> 50	9 (8.82%)	4 (3.92%)	6 (5.88%)	8 (7.84%)	27 (26.47%)
Type of group					
Male	6 (5.94%)	1 (0.99%)	3 (2.97%)	1 (0.99%)	11 (10.89%)
Female	6 (5.94%)	5 (4.95%)	3 (2.97%)	4 (3.96%)	18 (17.82%)
Youth	0 (0%)	0 (0%)	2 (1.98%)	0 (0%)	2 (1.98%)
Mixed	8 (7.92%)	20 (19.80%)	24 (23.76%)	18 (17.82%)	70 (69.31%)
Household head					
Male	12 (15.80%)	17 (22.40%)	16 (21.10%)	12 (15.80%)	77 (75.00%)
Female	4 (5.30%)	5 (6.60%)	5 (6.60%)	5 (6.60%)	19 (25.00%)
Total	16 (21.10%)	22 (28.90%)	21 (27.70%)	17 (22.40%)	76 (100%)
Education level					
None	1 (1.01%)	1 (1.01%)	0 (0%)	0 (0%)	2 (2.02%)
Primary	8 (8.08%)	12 (12.12%)	15 (15.15%)	6 (6.06%)	41 (41.41%)
Secondary	6 (6.06%)	12 (12.12%)	15 (15.15%)	16 (16.16%)	49 (49.49%)
College	4 (4.04%)	1 (1.01%)	0 (0%)	1 (1.01%)	6 (6.06%)
University	0 (0%)	0 (0%)	1 (1.01%)	0 (0%)	1 (1.01%)
Total	19 (19.19%)	26 (26.26%)	31 (31.31%)	23 (23.23%)	99 (100%)

**Table 3: Socio-demographic characteristics of farmers not belonging to a group**

N=71

	Central division	Gichugu division	Mwea division	Ndia division	Kirinyaga district
Informants interviewed	17 (23.94%)	25 (35.21%)	12 (16.90%)	17 (23.94%)	71 (100%)
Gender	Male 10 (14.08%) Female 7 (9.86%)	Male 19 (26.76%) Female 6 (8.45%)	Male 4 (5.63%) Female 8 (11.27%)	Male 10 (14.08%) Female 7 (9.86%)	Male 43 (60.56%) Female 28 (39.44%)
Age					
< 25	0 (0%)	4 (5.63%)	0 (0%)	1 (1.41%)	5 (7.04%)
26 – 50	8 (11.27%)	17 (23.94%)	11 (15.49%)	11 (15.49%)	47 (66.20%)
> 50	9 (12.68%)	4 (5.63%)	1 (1.41%)	5 (7.04%)	19 (26.76%)
Household head					
Total	13 (27.08%)	18 (37.50%)	4 (8.33%)	13 (27.08%)	48 (100%)
Male	10 (20.83%)	15 (31.25%)	3 (6.25%)	10 (20.83%)	38 (79.17%)
Female	3 (6.25%)	3 (6.25%)	1 (2.08%)	3 (6.25%)	10 (20.83%)
Education level					
None	2 (2.86%)	1 (1.43%)	0 (0%)	1 (1.43%)	4 (5.71%)
Primary	8 (11.43%)	10 (14.29%)	3 (4.29%)	5 (7.14%)	26 (37.14%)
Secondary	6 (8.57%)	11 (15.71%)	6 (8.57%)	8 (11.43%)	31 (44.29%)
College	1 (1.43%)	2 (2.86%)	3 (4.29%)	3 (4.29%)	9 (12.86%)
University	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)
Total	17 (24.29%)	24 (34.29%)	12 (17.14%)	17 (24.29%)	70 (100%)

A similar pattern was portrayed under the category of farmers not belonging to a group, where 31.4% male farmers had attained secondary school education compared with 12.9% female farmers, while 20% females had attained primary school education compared with 17.1% males. Some of the informants had attained college and university education. There were more women with college education in the category of farmers belonging (7.7%) than not belonging to a group (2.9%). However, it was observed that those who had attained university education (1.7%) were in the category of farmers belonging to a group and were male.

The data also showed that there were slightly more female farmers (5.1% in the category of farmers belonging to a group and 4.3% of the farmers not belonging to a group) who did not have formal education than male farmers (none under farmers belonging to a group and 1.4% under farmers not belonging to a group) (**Table 2** and **Table 3**). The emerging pattern suggests that more male farmers had attained higher levels of education than female farmers.

Compared to the national figures in rural Kenya, 19.5% among the category of poor households and 10.8% among the non poor category had not attended school, while the figures for Central province were 10% and 6.1% for the poor and non poor category respectively (RoK. KNBS 2008b:46). These findings showed that the farmers in Kirinyaga district were more educated than the rural population in Central province and Kenya in general.

The education system in Kenya has eight years of primary school education, four years of secondary school education and four years of university education (8:4:4 system). The findings of the present study showed high levels of education and hence literacy, with most farmers having attained primary and secondary school education and a few with tertiary education. Very few farmers (5.1% female farmers belonging to a group and 1.4% male farmers and 4.3% female farmers not belonging to a group) had not attained formal education. The general trend showed that more female than male farmers were uneducated and more male than female farmers had attained higher levels of education. There were more farmers belonging to a group than not belonging to a group who had primary and secondary education. In contrast, the study by Ngimwa, Ocholla and Ojiambo's (1997:51) in Kinangop in Kenya found relatively higher levels of education. They reported that 50% of the women had attained primary education, 18.3% had secondary education, 7.7% had post-secondary level education, while 24% were illiterate.

The finding of the present study on high levels of education among farmers in Kirinyaga district was however consistent with other authors in different geographic locations in Kenya. Davis's (2004:85) study in Meru district showed that on average, smallholders had 6.7 years of education, while Amudavi *et al.* (2009:29) established that about 50% of the farmers in Western Kenya had primary

education, 31.3% had secondary and 6.1% post secondary education, while 11.9% had non-formal or no education. The relatively high literacy figures for Kirinyaga district established by the present study could be explained by the influence of religion. The Anglican Church played a major role in the education system in Kirinyaga, especially for girls. Nevertheless, according to the GoK statistics for Kirinyaga district, the rate of school dropouts especially in secondary schools had been increasing because of high school levies (RoK. Ministry of Finance and Planning 2002a:21). However, the level of literacy in Kenya as a whole is likely to increase even more in response to the new government policy on compulsory “free” primary school and highly subsidised secondary school education.

In Zambia, Kaniki (1989:114) established that the majority of small-scale farmers had primary education because the country’s education system did not have any conditions such as passing exams for advancing from one class to another. In Tanzania, Kiondo (1998:138) found that 32.2% of the rural women did not have formal education. Other authors (Meyer 2000:147; Stefano *et al.* 2005b:61) in KwaZulu-Natal, South Africa, and Mamodu (2002:409) in Nigeria also found high levels of illiteracy among rural farmers. For example, Stefano *et al.* (2005b:61) found that 67.4% of the small-scale farmers in South Africa were illiterate, while Aina (2007:2) reported that the majority of farmers in Africa could not read or write. Turning from the rural to urban context, Byamugisha *et al.* (2008:96) established that 13.3% of the urban farmers in Uganda had attained degrees or diplomas, 43.3% had secondary school education, 36.7% had primary education while 6.7% did not have formal education. In emerging economies, Man (2009:11) found that 30% of the small-scale farmers in Malaysia had primary education, 33.2% had secondary education, 12.4% had tertiary education, while 24% did not have formal education. These findings have policy implications for ensuring inclusion in education of all farmers. The present study supports the suggestion of Iriwieri (2007:39), that illiterate farmers be provided with appropriately packaged agricultural information to enable them increase productivity.

Education empowers people to participate in development activities and increase productivity by inculcating the necessary knowledge and skills required to improve their capacity to generate income (RoK. KNBS 2008b:45). Empirical evidence has shown that education increased agricultural productivity in modern farming (Phillips 1994:160; Alene and Manyong 2007:152,158). According to Lockheed, Jamison and Lau (1980:61), the effects of education were mainly felt by farmers who had more than four to six years of education. Okello, Okello and Ofwona-Adera (2010:8) established that in Kakamega district in Western Kenya, the threshold was 6.5 years for female farmers and 8.8 years for male farmers. According to a study conducted by Moock (1976:835) in Kenya, the impact of education was greater for female than male farmers. Moock (1976) found that women who had not been to school performed better on efficiency than men who had attained only a few years of school.

### **6.3 Farming objectives of farmers' groups and small-scale farmers**

This section presents the results of the main objectives of small-scale farmers, the household's main source of food and income, and the main agricultural enterprises of groups and individual households. Farmers' groups and individual farmers belonging and not belonging to a group had different objectives.

#### **6.3.1 Objectives of farmers' groups**

Data collected from 90 farmers' group (N=90, 195 responses) showed that the main objectives of farmers' groups were to generate income (46, 21.0%), improve agricultural practices and adopt improved technologies (43, 18.3%), address social welfare activities (29, 12.8%), reduce poverty (16, 9.1%) and to access markets and good prices (15, 7.3%). Other objectives included conserving the environment, improving soil fertility, creating employment, ensuring food security, accessing services, learning and accessing knowledge and information and improving household and community health. A few health conscious groups indicated that their objective was to produce quality organic food that was free of chemicals to improve their health through improved nutrition

##### **6.3.1.1 Income generation**

Income generation was a key objective of 46 farmers' groups (21%). Some groups decided to cooperate and venture into agricultural activities to enable them to meet their parental obligations such as paying school fees and improving the quality of life of their households. Some groups got together to create a critical mass to jointly buy land, engage in productive and value adding activities such as production and sale of traditional medicines, banana wine and avocado soap, as well as the processing of honey. Others came together to venture into new high income generating enterprises such as growing French beans, passion fruit and sweet potatoes. Some groups came together to learn new skills such as making fireless cookers to generate income. In contrast, the objectives of most of the youth groups were to venture into economic activities that would earn them income (6, 60%), and to avoid idleness.

##### **6.3.1.2 Improving agricultural development / adopting new technologies**

Another fundamental objective cited by the farmers' groups was to improve agricultural development, improve farming techniques or to adopt new technologies. This objective was closely linked to income generation and accessing agricultural related services. NALEP and the "Njaa Marufuku Kenya" project (see **section 2.2.4.2**) have been instrumental in encouraging farmers to form common interest groups (CIGs) and Focal Area Development Committees (FADCs) to improve delivery of extension services. A number of CIGs have adopted high value enterprises such as the growing of tissue culture banana (TCB), cotton, Nerica rice, fish as well as value addition to increase food security and reduce poverty and hunger. Some were formed to meet specific needs

such as to practice small-scale irrigation and water harvesting techniques. The “Bayer tomato” groups pointed out that they came together in order to access the new high yielding and disease resistant tomato varieties, while the sweet potato group members came together to access improved sweet potato vines from KARI.

A number of groups are working with research and education institutions to conduct on-farm trials on IPM, to access seedlings of TCB, and control Striga weed through the “push - pull”<sup>60</sup> method. Some women groups explained that they formed groups in order to learn about home gardening so that they could improve the nutrition of their households and adopt value-adding practices such as making banana wine, banana and sweet potato chips, dried mangoes and avocado soap. Farmers’ groups in Ndia division (3) did not cite this objective as often as Central (14), Gichugu and Ndia (13 each).

#### **6.3.1.3 Addressing social welfare activities**

Community members faced many social and economic problems and formed social groups to address their common problems while providing moral, material and financial support to one another. There were 14.1% of the farmers’ groups who indicated that they came together to assist one another and engage in social welfare activities to generate social capital. The study area had many women’s groups that obtained resources together and started “merry-go-rounds.” Members of the “merry-go-round” group shared an agreed sum of money every month on a rotating basis for home improvement and personal development. Men had learned from the successes of the women’s “merry-go-rounds” and had adopted the practice in mixed and male only groups. Some of the farmers’ groups pointed out that they started as “merry-go-rounds” to save money and gradually diversified and ventured into development and agricultural activities.

Other groups started as Christian fellowships to pray and read the Bible together, encouraging each other and exploring ways to improve their social and economic status. The informants explained that the groups handled social welfare issues such as improving household nutrition, responding to bereavement, sickness and hunger in the community, education for children, weddings, looking after orphans, collecting firewood, farming, repair and building of modern houses (for example buying

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<sup>60</sup> Striga weed and stemborer pest could lead to 30-100% loss in maize yields in eastern Africa. The “push-pull” technology is a conservation agriculture technology that combines suppression and elimination of Striga seed, and is relatively cheaper than chemical methods. Besides, the “push-pull” technology does not spoil the environment. Maize is intercropped with Desmodium (a leguminous perennial cover crop that acts as the repellent), and Napier grass is planted as a border crop that acts as an attractant. The Desmodium repels the stemborers, which are attracted to the Napier grass. In that sense, the female stemborers are pushed away from the maize and are pulled to the Napier grass, thus keeping away the stemborers from the maize. The Desmodium stimulates the growth of Striga weeds but at the same time inhibits their growth hence striga seeds are not produced. Because Desmodium is leguminous, it fixes nitrogen in the soil and improves soil fertility.

iron sheets for roofing) and buying water tanks to store water for household use. The face-to-face contacts and friendships between members facilitated social interactions.

#### **6.3.1.4 Accessing markets and finding better prices**

Some farmers' groups were formed to facilitate access to markets and improve their bargaining power for obtaining better prices for their produce. The groups pooled their resources and improved their buying and marketing power. Marketing groups had been established for high value enterprises such as growing French beans, Asian vegetables, tomatoes and mangoes. One group indicated that there were many intermediaries who had a stranglehold on pricing and marketing agricultural produce in their area. They added that these intermediaries often worked towards artificially depressing the market prices to their benefit. In response to this challenge, some farmers had formed marketing groups to reach and exploit new markets and attain economies of scale. In a number of groups, the objective of accessing markets was linked to accessing agricultural inputs. In certain cases, however, some horticultural exporting companies approached farmers and encouraged them to form groups and work together. The companies provided the required inputs, training and technical backstopping and then bought the produce of group members. This was also true of cotton groups that formed to access seeds, inputs and market for their produce; dairy goat groups that sold goat kids and goat milk; as well as cereals, passion fruit seedlings, and tree and fruit tree seedlings groups that sold the related produce.

#### **6.3.1.5 Conserving soil, water and the environment**

Rapid population growth in the study area has led to devastating effects on the environment. It was observed that trees had been cut down to create land for cultivation, construction, fencing and to provide firewood for cooking. In some cases, steep slopes had been cultivated, leading to soil erosion and land degradation. These effects of high human population and destruction of the environment have led to drought, deforestation, declining soil fertility, low rain fall, rain failure, dropping of the water table, firewood shortages, destruction of water catchment areas and loss of biodiversity. Of the responses from focus group discussions with farmers' groups, 6.3% indicated that some groups were concerned about the adverse impact of their activities on the environment.

Such groups had responded to the changing climatic and environmental conditions by working together to establish tree and fruit tree nurseries (for their own use and for sale) and had planted trees in catchment areas to manage water resources and conserve the environment. While some of the groups were self-inspired as observed in one group (five women) that stated "we sat together and reasoned that if we planted more trees, we would have more rain for our crops," others were sensitised about the importance of conserving the environment by NGOs, extension or forest officers.



A number of environment and 4-K<sup>61</sup> Clubs have been established in primary schools in the study area to impart skills on how to manage and conserve trees to students who have been encouraged to plant trees around their school compounds, homes and catchment areas. In secondary schools, the Young Farmers' Clubs were promoting similar activities, while some were practicing agroforestry in their school "*shambas*."<sup>62</sup> Based on the rankings, this objective was found to be more important in Mwea (5 responses) and Gichugu (4) than Central and Ndia divisions, which had two informants each.

#### **6.3.1.6 Employment creation**

There was a high rate of unemployment in Kirinyaga district and most young people could not find jobs because there were no manufacturing or service industries in the area. Twelve (12, 5.8%) of the responses indicated that they formed groups with the objective of creating employment or using their time gainfully. For example, the Baricho youth self help group was established in 1996 to create employment (marketing fruit and vegetables). The group has gradually grown and become the Baricho vegetables and fruits group and acts as a collection centre for fruit and vegetables in Ndia division.

#### **6.3.1.7 Accessing agricultural services**

Small-scale farmers do not have adequate and appropriate agricultural information, knowledge and skills to improve their farming activities. Some do not have irrigation facilities and access to credit and security. Although only a few of the informants (11, 5.3%) mentioned accessing agricultural services as a key objective, the government policy on service provision and the strategy of the civil society and the private sector to deliver services through groups has catalysed the formation of many groups. As presented above, the NALEP Programme Phase two, and the "Njaa Marufuku Kenya" project promoted the formation of CIGs and FADCs to improve delivery of extension services and alleviate poverty and hunger. The informants pointed out that they formed groups to be able to access essential services such as extension, new technologies, training on various aspects of farming including production, IPM and value addition. The groups were also able to receive agricultural inputs from the public and the private sector and NGOs to access credit from financial institutions. Some had succeeded in accessing grants from the government and funds from development partners through projects and programmes.

Extension services under the current institutional arrangements within the Ministry of Agriculture, Ministry of Livestock, Ministry of Fisheries and other government departments had become demand

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<sup>61</sup> 4-K Clubs are youth groups in primary schools (usually in rural areas) that engage in agricultural related activities and cultivate their gardens in school under the leadership of a teacher that acts as patron. Such groups elect leaders to coordinate their activities but are not legal entities. The Young Farmers' Clubs are the counterpart of 4-K clubs in secondary schools.

<sup>62</sup> Shamba is a Kiswahili word used for a piece of land used for agricultural purposes.

driven and farmers were expected to belong to groups in order to access services. To help with group formation, the Ministry of Gender, Children and Social Development has been facilitating group organisation activities, registration of self-help groups and disbursing grants to qualifying groups. Encouraged by these arrangements and support, a number of groups had been established and registered in Kirinyaga district.

To stimulate innovation and a spirit of competitiveness, the Njaa Marufuku Kenya project encouraged farmers' groups to write proposals to access funding (through the Ministries of Agriculture and Livestock Development). The Ministry of Youth Affairs had especially encouraged the youth to form groups and write proposals for funding from the "Youth Development Fund" (YDF), which was launched in 2006 to create self-employment and generate income. Parallel to the YDF was the "Women Enterprise Fund," which became effective in 2006.

The private sector has also played an important role in providing access to agricultural services. For example, Bayer Company Ltd. established the Bayer tomato groups to access improved tomato seed varieties, training and input from the company. Other examples included the passion fruit groups that came together to access inputs and training from Drumnet (an NGO). It was noted that informants in Mwea (seven groups) cited the objective of accessing agriculture related services more frequently than the other divisions (two each for Central and Ndia, and none in Gichugu). Other examples of specialised interest groups included:

- i) French bean groups, which accessed seeds and agrochemicals on credit from horticultural exporting companies that buy their produce and deducted the costs for the inputs before payment. Groups provided cleaning, grading and packing services.
- ii) Cotton producing groups that were able to access credit facilities in form of inputs (seeds and agrochemical spraying services).
- iii) Dairy goat and rabbit groups that were able to access good breeds and training.
- iv) Some groups formed to access water for irrigation and improve agricultural development.

The emerging themes from the objectives cited by farmers' groups in the present study were comparable to those in Australia and South Africa, and included income generation, improving agricultural development and adoption of new technologies, addressing social welfare activities, accessing markets and better prices, conserving the environment, creating employment and accessing services (including knowledge and information). McClelland, Gartmann and Van Rees (2004:6) classified the objectives of farmers' groups into two i) groups whose explicit objective was to increase productivity, and ii) groups that had broader aims of productivity and community welfare. As was the case of the Birchip cropping groups in Australia (McClelland, Gartman and VanRees 2004:2), and farmers' groups in South Africa (Meyer 2000:154), most of the groups in Kirinyaga district

belonged to the second category, and focused not only on productivity but social, economic and environmental welfare of the community.

Meyer (2000:154) found that groups in South Africa were mainly formed to facilitate and simplify training by targeting community members sharing a common interest as opposed to individual farmers. Other objectives included the sharing of common problems, interests, expectations and visions of success; to access external information, to support one another in farming and social welfare issues, to share and exchange information and skills, to reduce costs through economies of scale by using joint transport when transporting produce to the market, purchasing inputs or hiring services such as ploughing. Likewise, the objectives of the Birchip cropping groups were comparable to those of farmers' groups in Kirinyaga district and included the increasing of profits, conducting agronomic research, providing training and information, and improving the welfare of the community (McClelland, Gartmann and VanRees 2004:6).

**Income generation:** The findings of the present study showed that the principle objective of farmers' groups was economic in nature. This finding was supported by other authors, for instance McClelland, Gartmann and VanRees (2004:5) in Australia established the Birchip cropping groups to help members to increase farm income. Lemlem (2009:17) in Ethiopia found that farmers joined the cooperatives to earn higher income through joint milk sales. On the other hand, Minten, Randrianarison and Swinnen (2009:1734-1737) found that vegetable contract farmers<sup>63</sup> in Madagascar mainly signed contracts with European supermarket chains because of the stable income that would be earned, to access inputs, learning and new technologies respectively. By comparison, most farmers' groups in Kirinyaga district producing horticultural produce signed contracts with horticultural exporting companies. The findings of the present study and other authors (Minten, Randrianarison and Swinnen 2009:1734-1737) suggested that a key consideration when introducing a new technology or enterprise was the potential income or profit it was likely to generate.

**Social capital and improving agricultural development:** The concept of social capital that was discussed in detail in **section 3.2.2.3** and **section 4.5.7.2** provided the basis for understanding the social activities of groups, and helped to operationalise the social interactions of farmers in groups (Woolcock 2001:10; Pretty and Wesseler 2004:3,5). The finding of the present study on farmers coming together to address social welfare issues was consistent with other authors (Davis 2004:92; Kamau 2007:137). The mutual respect and recognition of the importance of each member generated social capital (McClelland, Gartman and VanRees 2004:3). For example, Davis (2004:92) found that

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<sup>63</sup> Contract farming is a type of farming whereby a farmer, or small-scale farmers produce agricultural produce for a particular domestic or export market under a formal contract. Specific commodities are produced based on the target market specifications.

group members engaged in social activities such as caring for the bereaved, fellowship and money through the “merry-go-round,” while Kamau (2007:137) confirmed the findings of the present study that most groups started as “merry-go-rounds.” Trust was a prerequisite to sharing resources and reciprocating in social networks, and trust together with mutual understanding between group members developed as people got to know more and become open with each other (Kilpatrick and Bell 1998). For Putnam (2001), there was more likelihood of working together where people knew and trusted each other. The network aspect of farmers’ groups was met by the regular meetings. The kinship ties, shared values and trust among members helped members do good things for one another and facilitated the flow of information (Rose 1999:2), and the trust and relationships between group members yielded social capital (Pretty and Wesseler 2004:3,5), which resided in relationships between group members (Woolcock 2001:10).

**Accessing markets and finding better prices:** The finding of the present study on formation of groups to improve market access presented above was similar to that of Davis (2004:92) and Minot and Ngigi (2004). Davis (2004:92) found that farmers’ groups in Meru district, Kenya facilitated the marketing of milk, cotton, tobacco, mangoes and honey. Minot and Ngigi (2004) found that small-scale horticultural farmers in Kenya had formed marketing groups to avoid market intermediaries, and were successfully selling their produce directly to exporters. As was the case with some groups in the present study, the groups engaged their own technical officers to oversee production and provide advice to farmers to ensure they produced quality produce that met the export market standards.

In comparison, Pokhrel and Thapa (2007:157) observed that farmers in Nepal trusted their fellow farmer colleagues who collected produce for sale because they had established strong social ties over the years and considered them to be more trustworthy than marketing intermediaries. A similar marketing model to the model of farmers’ groups and horticultural exporting companies in Kirinyaga district operated in Madagascar, in which farmers were contracted to produce vegetables for supermarkets in Europe (Minten, Randrianarison and Swinnen 2009:1733). For example, comparable to the Kirinyaga model where some horticultural exporting companies provided farmers with inputs, Lecofruit (an exporting company) had subcontracted more than 9,000 small-scale farmers in Madagascar to produce vegetables on contract and employed technical extension officers to backstop and supervise production and ensure adherence to standards set by the company. Inputs (seeds, fertilisers and pesticides) were provided on credit to all farmers to ensure consistency of produce, and the marketing groups cushioned farmers against vulnerabilities due to price shocks. The findings of the present study and those of other authors discussed above suggest that farmers’ groups gained knowledge through collective activities such as group marketing, training and advice from extension or technical officers.

In the Kenyan, Nepalese and Madagascar examples above, the mutual interactions between group members acted as social capital that guarded the farmers against exploitation, and trust was the active ingredient that led to the success of the marketing arrangements. Trust and cooperation between farmers groups and the marketing agents were thus the outcomes or benefits of social capital (Woolcock 1998:185; 2001:13; Putnam 2001:7) and yielded a win-win situation between the producers and the marketers. Basing the interpretation on the broader definition of social capital by Lyon (2000:664) as encompassing trust, norms and networks, or as “the value of connectedness and trust between people” (Pretty and Wesseler 2004:3), trust was observed as emanating partly from the success of contracts and trading relations between the farmers’ groups and exporters (in the case of Kenya) in meeting common objectives. Social pressures, moral obligations and existing networks (Lyon 2000:665,671-676) were also influential. According to Lyon (2000), farmers and horticultural exporters or traders develop trust and cooperation develops through social relation processes. Darroch and Mushayanyama’s (2009:100,104) study in South Africa showed that trust between farmers and the market chain actors was a precursor to cooperation, and demonstrated that satisfaction and trust led to cooperation, which led to commitment. The findings of the present study, and those of other authors (Minten, Randrianarison and Swinnen 2009:1733) have policy implications for the marketing of farmers’ produce, and point to the need for government, the private sector, CSOs and other relevant actors to provide more support to farmers in the marketing of their produce and support the formation of market access centres. Although the GoK had developed a national export strategy and action plan (RoK 2005b), farmers still experienced marketing challenges, and there was a need for reforms and enforcement of implementation.

**Conserving soil, water and the environment:** The objective on conserving the environment addressed a very important niche in Kirinyaga district, given the high population, small land sizes, forest destruction and major fuelwood shortage (RoK. Ministry of Finance and Planning 2002a:22,29). Access to information and knowledge on the environment led to some efforts towards tree planting, soil and water conservation and conservation of biodiversity in Kirinyaga district, which went a long way towards meeting some of the wood fuel needs of households and protection and conservation of the environment. The findings of the present study partly confirmed Marshall’s (2004:284) observation in Australia, that farmers were cooperating and carrying out socially oriented environment related activities that brought benefit to the larger community. As pointed out by Sharp and Smith (2003:925), the “actions of one or a couple of farmers can damage the resource for all farmers” hence there was a need for collective community effort that created social capital and increased understanding of environmental and aesthetic objectives. In Australia, the Birchip cropping groups integrated environmental values in community practices to help restore indigenous biodiversity (McClelland, Gartmann and VanRees 2004:6).

Likewise, Webb and Cary (2004:5-7) showed that the Landcare movement in Australia which comprised individuals and groups that subscribed to environmental management. The movement adopted a bottom-up approach that embraced social capital through engagement with environment related activities such as field days and meetings that raised awareness, provided skills in conserving soil and water and provided a platform for the exchange of information and ideas. As pointed out by The World Bank (2010a:134,135), information supports the management of natural resources. The findings of the present study and those of authors in Australia suggested a need to motivate farmers to engage in sustainable NRM activities to preserve the environment for the benefit of the larger community. The findings also suggest the need to repackage appropriate information on NRM for small-scale farmers and students.

**Employment creation:** Farmers' groups such as the Baricho vegetables and fruits group were an important source of employment for many rural people. Similar achievements were observed by the Birchip cropping groups in Australia, which has grown into a network that creates job opportunities (McClelland, Gartmann and VanRees 2004:6,7). As presented in **section 2.2.1**, the agricultural sector plays a very important role in creating employment opportunities and provided employment to more than 80% of the workforce in Kenya.

**Addressing social activities:** The findings of the present study showed that farmers formed social groups to solve common problems and provide support for one another. This finding suggests that the needs of small-scale farmers and farmers' groups were linked to their desire for fulfilling specific fundamental roles such as the need for security in their social settings. As emphasised by Wilson (1981; 1999:252), information is sought and used under social situations which are broad and include the environment under which the 'work-role' is carried out.

**Accessing agricultural services:** The findings of the present study showed that a number of groups came together to access extension, training, information, knowledge and technologies, credit and funding, irrigation services as well as social services. Stringfellow *et al.* (1997) showed that farmers' organisations such as farmers' groups improved access to agricultural services through pooling resources and attaining economies of scale, and through sharing common services such as transport, value addition and marketing. However, Stringfellow *et al.* (1997) found that some groups that had been established in haste did not match the skills and experience of farmers to the activities undertaken by the group and resources. Nevertheless, a number of groups in the present study indicated that they had come together to access markets and market information. Likewise, in Vietnam, farmers who formed marketing cooperatives identified the benefits of groups as access to training, technical and market information, sharing of experience and knowledge, accessing inputs at reduced prices, better prices and deeper insight into markets and the marketing chain (Chau *et al.*

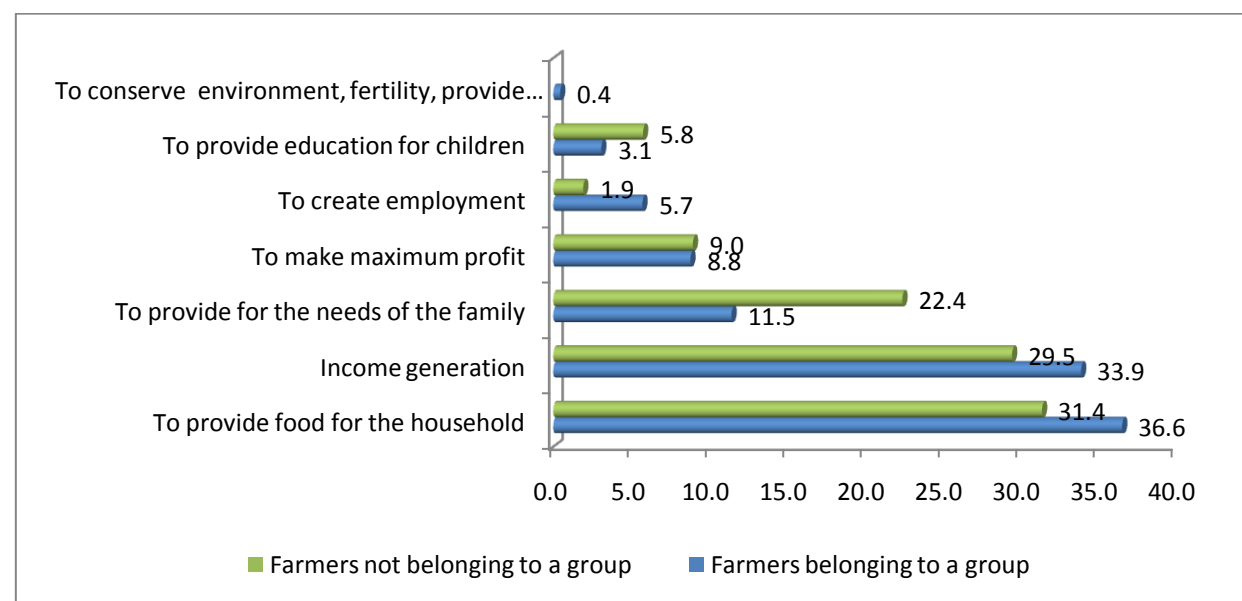


2004:108). The findings of the present study and other authors demonstrate the importance of groups in finding new markets and negotiating for better prices for farmers' produce.

The present study findings showed that a number of groups came together to be able to access irrigation services. Irrigation helped to improve food security, diversify production, improve household nutrition and increase income (Neubert *et al.* 2007:13). However, the potential of irrigation has not been fully exploited in Kenya and only 6.9% and 4.6% of the non poor and poor households respectively practice irrigation (RoK. KNBS 2008b:345), compared to 40% in Asia (UNECA and AU 2009:12). In an effort to improve water resources management, the Ministry of Water and Irrigation in Kenya launched the National Water Resources Management Strategy in 2008 and operationalised the Water Appeal Board. The government also instituted a decentralisation strategy in the water sector institutions and empowered community members to play a more significant role in water affairs (RoK. KNBS 2008a:167). These findings point to the need to provide information on irrigation and increase investment in water resources to enable farmers to access irrigation water.

### 6.3.2 Objectives of individual small-scale farmers

Farmers belonging to a group (N=102, 226 responses) and farmers not belonging to a group (N=71, 156 responses) shared similar objectives but unlike farmers' groups, their primary objective was to provide food for the household (see **Figure 8**).



**Figure 8: Main objectives of small-scale farmers (belonging and not belonging to a group)**

N=102 farmers belonging to a group, N=71 farmers not belonging to a group

The main objective of individual small-scale farmers belonging to a group (N=102, 226 responses) was to provide food for the household (83, 36.6%). Others were to generate income (76, 33.9%), to provide for the needs of their families (26, 11.5%), to maximise profit (20, 8.8%), to create employment (13, 5.7%), to provide education for children (7, 3.1%) and to conserve the environment, improve soil fertility and provide fuelwood (1, 0.4% of cases). The findings on the objectives of farmers not belonging to a group reflected a similar pattern to those of farmers belonging to a group (see **Figure 8**). However, there were no informants among the category of small-scale farmers not belonging to a group who mentioned conserving the environment.

The findings of the present study showed that the objectives of farmers' groups were different from those of individual farmers. While the main objectives of farmers' groups were to increase profits, improve agricultural practices and adopt improved technologies, address social welfare activities, reduce poverty and access markets, the key objectives of farmers belonging to a group were to provide food for the family and ensure food security, to generate income and to provide for the needs of the household. The first two objectives of individual farmers were similar to those observed by Shibanda (1999:409), who found that the main objectives of individual smallholder fish farmers in Western Kenya were to supply food and generate income. Likewise, the findings were consistent with those obtained by Fakava, Nurthall and Nartea (2001:9), who established that the main objectives of subsistence farmers in Tonga were home sustenance, risk minimisation, religious obligations, leisure time and profit maximisation. In comparison, Sambodo (2007:165) found that the main objectives of farmers in Indonesia were to generate income, pay fees for their children and provide for the needs of the family.

The findings suggest that the objectives of individual farmers belonging to a group were linked to the group objectives, and included personal objectives such as providing for the needs of the family, economic and community welfare aspects such as conserving the environment, improving soil fertility and providing fuelwood. The finding on individual farmers conserving the environment supports practices of farmers in other regions. For example, farmers in the Amazon were applying local knowledge and were using natural products such as biochar to improve soil fertility (The World Bank 2010a:17). The findings also showed higher figures for the objective to create employment among farmers belonging to a group than for farmers not belonging to a group (5.7% versus 1.9%). The differences between the objectives of individual farmers belonging to a group and farmers not belonging to a group demonstrate the influence of group learning on individual farmers.

#### **6.4 Establishment of farmers' groups**

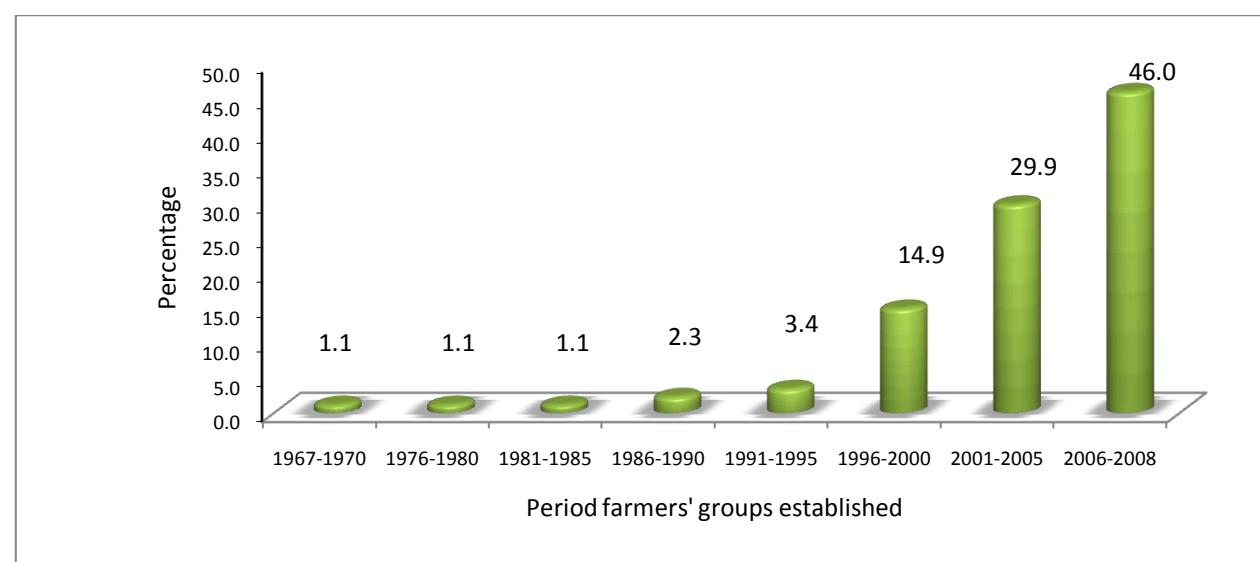
This section presents and analyses results and interprets findings on the date of establishment of farmers' groups, group membership, structure, and leadership. Most of the groups in Kirinyaga were



established following similar steps to those of Chau *et al.* (2004:109-110), which comprised i) learning about the benefit of groups and to attend preliminary training based on the objectives of the group and to identify potential farmers; ii) steering, which entailed the formation of an interim steering committee to create awareness, draft rules and guidelines for the group and oversee the stages of group formation; iii) forming, to elect leaders and register the group or cooperative; iv) implementation, to draw an action plan for implementing group activities.

#### 6.4.1 Date of establishment of farmers' groups

Data from 87 focus group discussions with farmers' groups showed that the groups were established between 1967 (41 years old) and 2008 (less than one year old). One group was established in 1967 (a mixed group) in Mwea division. Three female only groups were established between 1978 and 1987 in Ndia and Mwea divisions. The male only groups were founded after the year 2000, while the youth only groups were formed after the year 2005. More than three quarters of the groups (76.7%) were registered after the year 2000 (see **Figure 9**). The data collected indicate an exponential growth in number of farmers' groups established from the late 1990s onwards. Twenty (20 groups, 23%) were registered in 2006 and 11 groups (12.6%) in 2007. **Appendix 25** depicts details on the span of years within which groups were established, frequency, percentage and age of groups.



**Figure 9: Period of establishment of farmers' groups in Kirinyaga district**

N=90

#### 6.4.2 Group size and composition by gender and age

The group sizes varied with the group status. The groups with the status of cooperatives (N=2) had memberships ranging from 16 to 300. The mean group size for the cooperatives was 158 members. The groups with farmers' groups status (N=88) had group sizes ranging from 12 to 138 and the mean

was 29 (28.7) (see **Appendix 26**). The proportion of males to females was 44.9 males to 54.6 females. It was observed that although there was no significant difference in the membership by gender (N=81), the study sample had three times as many female only groups as male only groups (15 and 5 respectively). However, these proportions were not reflected in the study sample. As presented earlier in **section 6.2.4**, the study sample had a female: male ratio of 2:3, possibly because women had many more household and farming duties (Salasya and Hassan 1998:77-81), hence fewer turned up for the interviews and focus group discussions. The farmers' groups were asked to state the age of the youngest member and the oldest member in their group. The youngest member in the groups (N=71) was 18 years with a mean age of 28.2, while the oldest member was 95 years old with a mean of 64.3.

#### **6.4.3 Requirements for membership**

One key requirement for group membership was payment of a registration fee. Data collected from the farmers' groups indicated that the membership fee varied from group to group, from 20 Kenya Shillings (0.25US Dollars) to 10,000 Shillings (125US Dollars). Registration fees for some groups were initially low, but as members made investments, the shareholder value increased hence over time new members were required to pay a much higher amount to be on par with older members. Some enterprising groups had bought land, buildings or had invested in the stock market. The groups also paid a regular (monthly, weekly, bi-weekly, bi-monthly) contribution and welfare fee, which varied from group to group. Other prerequisites of membership were active participation in the group activities, regular attendance of meetings, adherence to the disciplinary code, regulations and constitution, being trustworthy and of good standing in the community. For some groups, it was a requirement that members be over 18 years of age (must have a national identity card), while others had set age limits at 18 – 35, or more than 20 years and less than 70 years.

Other key requirements for group membership included: i) engaging in the production of the specific enterprise(s) of the group. ii) For enterprises such as the growing of irrigated rice, it was a requirement that members had access to land (own or leased) and water for irrigation. iii) Some groups stipulated that members must be able to read and write in English. iv) Groups that had adopted dairy goat farming required that members be registered with an association linked to the group focus - the Dairy Goat Association of Kenya (DGAK), or v) have the group's uniform. vi) While a particular level of education was not a requirement of most groups, it was observed that in three groups, members interested in vying for leadership needed to have attained a minimum of secondary school education. vii) One farmers' group indicated that their group was specifically for leaders and to qualify for membership, one had to be a leader in the community. viii) Some groups required that members be married and ix) others deemed it necessary to have a functional bank account.

#### **6.4.4 Structure, rules, funding, culture and gender**

Most farmers' groups in Kenya had similar structures based on the guidelines they obtained from the Ministry of Gender, Children and Social Development prior to their registration. The groups had an executive committee comprising a chair, vice chair, secretary and vice secretary, treasurer and committee members. Some groups had a discipline master<sup>64</sup> and a patron. The formal groups had a constitution guiding the conduct of members and the activities of the groups. The informal groups had set some in-house rules to guide their conduct and activities, while the few groups that were newly formed were in the process of developing rules.

Funding for most group activities came from contributions by members, "merry-go-rounds" and proceeds obtained from the sale of farm produce. Some groups obtained seed money from development partners such as the USAID and European Union (EU) and the Coffee Development Fund (CoDF). Others received project grants to support specific activities such as from IFAD and the Njaa Marufuku Kenya project. Some groups obtained loans from microfinance and credit institutions such as Equity Bank.

Although most farmers' groups (N=89) indicated that culture did not play a major role in most groups (72 groups, 80.9%) in Kirinyaga district, some groups were emphatic that culture did play a role and pointed out the different roles that men and women played in the community and in groups and in determining group leaders. Three groups asserted that culture had a key role in the selection of leaders, and explained that traditionally, men were expected to take leadership positions while women carried out other supportive duties. One group highlighted the role of religious values and indicated that their group was guided by Christian teachings.

A key informant interviewee stated that women carried out most of the work on the farm such as planting, weeding and harvesting while men did less work. Confirming this statement, another key informant said, "women provide farm labour while men manage the farms and market the produce." Men were more involved in the production of cash crops while women produced subsistence crops such as maize and beans. When constructing a shed for selling farmers' produce or building a goat's house, men often dug the holes and gathered posts, while women looked for grass to thatch the structures, which were traditionally their roles. Grading produce was done by all group members irrespective of gender. Young people were involved in French beans, tomato production and other enterprises that matured fast and were not labour intensive.

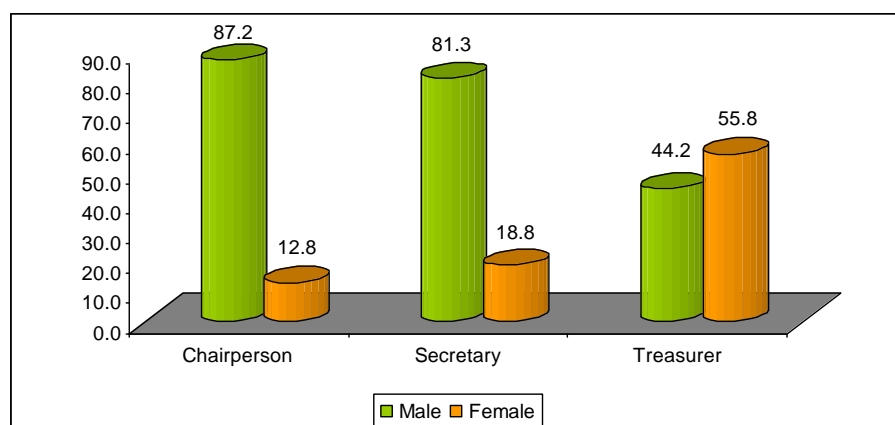
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<sup>64</sup> The discipline master was responsible for guiding members to support group activities and helped to maintain good discipline among group members regarding behaviour at meetings.

Almost two thirds (53 groups, 59.6%) of the farmers' groups (N=89) indicated that gender did not play a major role in the organisation and structuring of groups. However, 16 groups (18%) stated that gender played a role. Three groups pointed out that they deliberately ensured that two thirds of the executives were female to ensure women's representation in leadership. However, as observed by one group, the chairperson was often male even in groups that had more women than men. One group remarked that most leaders were male, while another affirmed that women were not involved in leadership. Some groups remarked that half the committee should be women. Others said that the youth performed lighter duties and ran errands, women carried out lighter jobs, while men carried out the more strenuous jobs.

#### 6.4.5 Group leadership (in relation to gender)

The leaders of most mixed groups were predominantly male. Data collected from 48 of 61 groups (13 groups did not specify the gender of their leaders) revealed that the ratio of male chair to female chairpersons was almost 7:1. Of the respondents, 41 (87.2%) indicated that they had a male chair and only 6 (12.8%) had a female chair. A similar pattern was portrayed for the position of secretary, with a male: female ratio of 4:1. There were 39 (81.3%) for male secretaries in contrast to 9 (18.8%) for female secretaries. However, there were more female than male farmers who held the position of treasurer. Results showed a male: female ratio of 4:5, with 44.2% of the responses indicating that the treasurer was male and 55.8% female (see **Figure 10**). As pointed out by key informants, some group members and supported by the data collected, women were often given the positions of vice chair or vice secretary, or were brought in as committee members. Women were, however, more trusted with money than men, hence, there were more female treasurers. Some groups did not state the gender of their leaders but acknowledged that there were fewer women in leadership positions. Some of their narrations include "there are more male leaders," "we are mixed," "but there is a gender balance," or "women are included in the executive" (meaning they are incorporated in the committee).



**Figure 10: Gender of group leaders**

N=48 groups

#### **6.4.6 Responsibilities of groups and members**

This section presents information on the responsibilities and activities carried out by leaders and group members.

##### **6.4.6.1 Group leaders**

The main responsibilities of chairpersons in groups were to chair meetings, to manage, lead, guide, direct, modulate and coordinate the group activities. The secretaries were responsible for taking minutes and maintaining the group's records and documentation, while the treasurers handled the group's bank accounts, financial resources and records. The executive committee was charged with the responsibility for planning and priority setting, monitoring of group activities, finding markets for the produce of the group, representing the group at meetings and training sessions and sourcing information and knowledge on behalf of the group. Other duties of the executive committee included sourcing funding and financial support for the activities of the group, ensuring the group objectives and production targets were met, ensuring members abided by the rules and regulations of the groups, and resolving conflict among group members.

##### **6.4.6.2 Groups and members**

Group members were expected to participate actively in the activities of their groups and to cooperate with their leaders and other members in order to attain their set objectives. Members were expected to abide by the group's constitution, contribute ideas and solutions, attend meetings regularly, honour their financial obligations and share and exchange agricultural knowledge and information. Farmers' groups carried out various farm and non-farm activities including husbandry, processing and marketing. The groups produced a variety of enterprises presented in **section 6.5.1**, and participated in capacity building activities such as training, seminars and visits. A few carried out business related activities such as managing of *posho*<sup>65</sup> mills. In addition, the groups were involved in social activities such as visiting sick members of the group and orphans, contributing to "merry-go-rounds" and savings and credit schemes and table banking, and supporting each other in times of bereavement and weddings.

When asked to state the role of farmers' groups in the community, one key informant remarked, "Farmers' groups play a very key role in the community" and added, "Women have taken loans to support their agricultural activities and there are very few defaulters because the groups act as guarantors." Another remarked, "Groups help to mobilise resources through "merry-go-rounds" to undertake development projects and provide a forum for training and meetings."

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<sup>65</sup> Posho mill – Posho is a Kiswahili word for a mill that grinds grain to powder (usually maize as well as wheat, millet, cassava and other grains)

#### **6.4.7 Venue of group meetings, frequency and time of meetings, and discussions at meetings**

The farmers' groups (N=89) met at diverse venues and at different times to discuss varied things. Most groups (48, 53.9%) met at a group official's or ordinary member's compound on a rotation basis while others met at a fixed place. One fifth of the groups (18 groups, 20.2%) met at public places such as a church compound, an education institution, chief's office, cattle dip or coffee factory. Fifteen (15) groups (16.9%) met at various marketing outlets such as horticultural produce marketing sheds, market places and shopping centres. Four groups (4.5%) met at tree nursery sites, green houses or fishponds. Two groups (2.2%) met in the forest near their beehives while 1 group each (1.1%) met at the *posho* mill plot or in a room rented for group meetings respectively.

Half the groups (44, 50.6%) met once every month, 22 (25.3%) once every week and 16 groups (18.4%) every two weeks and a quarter. Three groups (3.4%) met when the need arose, and one group each (1.1%) twice every week and once every two months respectively. Some groups held annual general meetings while others did not. The groups met on different days of the week. While some met on weekends, others preferred to meet on weekdays based on the convenience and availability of most members. Some groups met in the mornings and others in the afternoons.

At the meetings, the groups discussed a variety of things relating to the objectives of the group including confirmation of previous minutes, matters arising, the duties carried out by the groups, review of group activities and progress, future plans and developments, registration of new members, finances of the group, funding opportunities, status of existing and future investments and loans. The groups also discussed challenges they experienced and disciplinary measures. During the meetings, the groups underwent training, shared ideas, experiences and agricultural information and knowledge through interactions. The groups also discussed social issues that bound the group together such as illnesses, births, bereavements and weddings.

**Group age, size and composition:** This study showed that some groups were relatively old and one group was 41 years old while others were a few months old. Most of the groups were registered post 2000. The exponential growth in number of farmers' groups established from the late 1990s onwards is likely to have been a response to calls by the government, civil society and the private sector actors to form groups in order to access inputs, services and the funding sources, which became available. The funding sources included the Constituency Development Fund (CDF), which was launched in 2003, the Women Development Fund (WDF) that was conceived in 2006 and became effective in 2007, and the YDF that was launched in 2006. This study showed that group sizes varied from 16 to 300 members and a mean group size of 29 for groups with farmers' groups status compared with the

CARE Agroforestry project groups in Western Kenya, which had between 15 to 20 members per group (Noordin *et al.* 2001:511), and the MVIWATA groups in Tanzania which had between 15 to 200 members per group (Ekoi and Hepelwa 2003). According to Pretty (2003b:1914), typical farmers' groups had between 20 and 30 active members. A survey carried out by Curtis and Cooke (2006:10) in Australia showed that an average size of the Landcare groups was 31 in 1998 and 44 in 2004. The larger group size in Australia was explained by the merging of groups. On the other hand, Madukwe (2006) and The World Bank (2009a:64) suggested group sizes of 20 to 30 and 10 to 20 members respectively in most developing countries. According to Madukwe (2006), the bottom line was to have a manageable group size that permitted face-to-face interaction and "free flow of information."

**Requirements for membership:** To join a group, members needed to be over 18 years of age, pay a registration fee which varied in amount from group to group, pay regular contributions and welfare fee, be active in group activities, attend meetings regularly, adhere to group rules and regulations, be trustworthy and of good standing in the community. Some groups had special requirements such as access to be a leader in the community, be married and have a functional bank account. The membership criteria identified by the present study were not unique to farmers' groups in Kirinyaga, as groups in other parts of Kenya and beyond had similar membership requirements. For example, Davis (2004:100) confirmed the findings of the present study that members of the dairy goat groups in Meru district, Kenya had to pay a registration fee, belong to the local community, be married and be more than 18 years old. In the case of the groups in Kirinyaga district, it was a requirement by some groups that members be literate and have a functional bank account. In Australia, McClelland, Garmann and VanRees (2004:6) established that group membership was based on payment of a membership fee of 230 Australian dollars (209 US dollars).

**Structure, rules, funding, culture, and gender:** The findings of the present study on structure were similar to those of Davis (2004:91), who found the structure and organisation of groups of chairperson, secretary, treasurer and committee. The findings of the present study showed that some groups had a discipline master and a patron. Unlike the governance structure in Kenya, some groups in South Africa were run by a committee comprising a chair and four members and were officially registered under the local cooperative (Meyer (2000:155). In contrast, the Australian Birchip cropping groups had a board with a chief executive officer, a general committee, subcommittees, advisory committee and an alliance with a satellite group (McClelland, Garmann and VanRees 2004:6).

Rules were an important aspect of group organisation and as pointed out by Pretty (2003b:1913), once trust was established between group members, it was necessary to have common rules and

norms that governed behaviour of members and for efficient running of the groups. The rules helped to ensure the objectives of the group were attained and helped to discipline errant members. Most groups in Kirinyaga district had a constitution based on the guidelines they obtained from the Ministry of Gender, Children and Social Development. Although most of the groups in Kirinyaga district funded the group activities from contributions by members and sale of produce, groups such as the Birchip cropping groups in Australia sustained their activities with support from corporations, projects and membership fees (McClelland, Garmann and VanRees (2004:5,6). On the other hand, the Landcare groups in Victoria, Australia received most support from the Catchment Management Authority, the government, other groups, the Victorian Farmers Federation and projects (Curtis and Cooke 2006:24).

On culture and gender roles in group organisation, Salasya and Hassan (1998:77-81) found that male farmers in Kenya found it easier than female farmers to access education, extension, training, technology and credit services. They observed that male farmers spent more time on land preparation while female farmers engaged more in post harvest activities, weeding and harvesting. In the livestock sector, Curry, Kooijman and Recke (1998:95-98) noted that generally the female farmers were responsible for milking, while male farmers took livestock to the dip and made decisions on the marketing of milk. In Fiji, Bachmann (2000:99) established that farmers spent significant time (5-15 hours a week) on religious and communal activities. Other authors (Suda 2002:313; Di Mauro 2003:518; Omwoha *et al.* 2007:370; The World Bank 2009a:15) have indicated that women produced most of the subsistence crops, while men dominated the production of cash crops. Emphasising the different roles of men and women in society, Gotschi, Njuki and Delve (2009:276) pointed out that groups merely brought to light the power structures that were prevalent at household and community level. They argued that by comparison to mixed groups, female only groups yielded less social capital.

The findings of the present study and those from the literature (Curry, Kooijman and Recke 1998:95-98; Bachmann 2000:99; The World Bank 2009a:15) showed the importance of respecting people's cultures, religious view points and practices. Since men and women played different roles, the findings underscored the importance of mixed groups, and the need to include men, women and youth in group leadership. The mix would ensure gender sensitive issues in the group were properly handled by management and that the tasks assigned to group members were responsive to the traditional roles carried out by men, women and youth. Additionally, the differences in activities carried out by male and female farmers imply the need for gender sensitivity in designing information resources for farmers.



**Group leadership:** Strong leadership contributes to the success and sustainability of farmers' groups (Chamala and Shingi 1997; McClelland, Gartmann and Van Rees 2004:8; Curtis and Cook 2006:42). The present study found that very few female farmers hold leadership positions with the exception of the treasurer position. Most of the chairpersons and secretaries in farmers' groups were males. Davis (2004:113-114) and found a similar pattern in Meru district but her findings showed higher proportions of female leaders compared to the figures obtained by the present study, because of affirmative action<sup>66</sup> by the project leaders, who required that women be incorporated into leadership positions. The reason advanced for having more female than male treasurers confirmed earlier studies (Davis 2004:198; Gotschi, Njuki and Delve 2009:273), which established that women were perceived to be more trustworthy and transparent in their dealings. In their study of smallholder farmer groups in Mozambique, Gotschi, Njuki and Delve (2009:273) found that the positions of president (chair), vice president (vice chair) and secretary in mixed groups were largely held by men, while the position of treasurer was held by women, implying that most power in groups was held by men. Other authors also noted the under-representation of women at the decision making levels (Kabutha 1998:223; Kiondo 1998:243-244; Mchombu 1999:212).

According to Davis (2004:157), there was a higher success rate on the index of adoption among male leaders than female leaders. Likewise, a study by Barham and Chitemi (2009:57) in Tanzania suggested that having male leaders may be advantageous to groups. They argued that the female only groups were more disadvantaged than the male only groups in terms of marketing the group's produce and found that groups with a higher male: female ratio leadership were more likely to access better markets. In support of these authors, Gotschi, Njuki and Delve (2009:273,275) confirmed that men enjoyed better opportunities in group leadership than women, such as accessing information or institutional contacts. A possible area for further research would be to explore the role of gender in seeking markets and market information.

**Responsibilities of group leaders and activities of groups and members:** The study findings showed that group leaders had the important responsibilities of managing, leading, guiding and coordinating the activities of groups. These responsibilities identified by the present study compared well with Meyer's (2000:155) findings in South Africa, which included registering the groups, planning and scheduling training with trainers, selecting venues for training, resolving conflicts, arranging for agricultural services such as purchasing of inputs, accessing credit, ensuring members applied the skills imparted to them and the long term planning of the group's activities.

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<sup>66</sup> Affirmative action in Kenya is used to denote preferential treatment accorded to women to redress gender discrimination. A specified percentage in leadership positions, jobs, and education opportunities among others are often deliberately reserved for women to address the inequalities.

The key responsibilities of group members were to participate actively in group activities, abide by the group's rules and regulations, contribute ideas, solutions, information and knowledge, attend meetings regularly and honour their financial obligations. By comparison, the Birchip cropping groups in Australia entailed some activities that were similar to those established by the present study, which included participation in adaptive and collaborative research, the packaging and dissemination of information and participation in training (McClelland, Gartmann and VanRees 2004:6).

**Venue, frequency of group meetings and discussions at meetings:** Most farmers' groups in Kirinyaga district met at the homes of group members or public places such as schools, churches and market centres that were easily accessible and convenient for members. Meyer (2000:155) in South Africa found that groups met under a tree, at the local store, home or school compound. Davis (2004:137) observed that the groups in Meru district, Kenya mainly met at churches. However, in Australia, groups such as the Birchip cropping groups used to rent office premises but eventually had their own building (McClelland, Gartmann and VanRees 2004:6). These findings showed that the choice of venue and the frequency of meetings were based on convenience of the location and cost implications.

The findings of the present study showed that farmers' groups met regularly, with about a half meeting every month, a quarter meeting every week, about a fifth meeting every two weeks and other frequencies to share ideas and exchange agricultural information and knowledge. Davis's (2004:91) study showed that the most groups in Meru district, Kenya met every week or every month. The collective approach enabled all group members to work together and learn together and from each other in a coherent manner. Farmers valued opportunities for learning and motivating each other, and developed new knowledge through interactions. The meetings further provided platforms for social interaction and for discussing agricultural related topics through which farmers shared tacit and explicit knowledge that was applied to improve farming and productivity. As noted by Hoffmann Probst and Christinck (2007:360), learning occurred through the actions of the day-to-day practice and experience over time.

## **6.5 Main agricultural enterprises produced by groups and individual farmers**

Data collected from farmers' groups and individual farmers showed that Kirinyaga district produced some 56 different enterprises. According to one key informant, more than 66 enterprises were produced in the district. The large number of enterprises demonstrate the high potential and diverse agroecological and climatic conditions in the district, ranging from forest to semi-arid zones.

### 6.5.1 Main enterprises produced by farmers' groups

Section 2.3.1.3 highlighted the major cash and subsistence crops produced in Kirinyaga district for the local and export markets. Data collected from 88 farmers' groups indicated that the main enterprises they produced were ruminants, vegetables and melons, legumes, fruit and nuts (including bananas), cereals and tree and fruit tree nurseries (crops are classified under the United Nations Indicative Crop Classification (ICC)) (see **Appendix 27**). The farmers' groups produced 51 different enterprises in the four divisions including the production of TCB (22 responses, 10.3%), maize (21, 9.8%), coffee (16, 7.5%), tree and fruit tree nurseries (16, 7.5%), French beans (15, 7.0%) dairy goat (14, 6.5%), dairy cattle (13, 6.1%), poultry, bee keeping, and tomatoes (7, 3.3%) each.

Interviews with key informants identified French beans as a very important enterprise in all the four divisions. Although the data above reflected only 15 responses, this was because the ICC classification of crops grouped French beans under legumes, while many informants referred to French beans using the broader term of horticulture, which is classified under vegetables.

**Appendix 27** and **Appendix 28** presents a break-down of the main enterprises by category and geographic division respectively. Four (4) groups carried out value addition of avocado (soap making) (all in Ndia division), and one group was making medicines using Stinging nettle (*Urtica dioica*) (in Gichugu division). Community members used Stinging nettle for cooking the Kikuyu *irio*<sup>67</sup>, for stomach ailments, skin diseases, fever, rheumatic joint aches and pains, and for blood purification. One farmer remarked, "Stinging nettle is also good for cows. We mix it with animal feeds to improve palatability and use it to get the cows on heat." Of the 13 groups that had adopted the dairy cattle enterprise, five were in Central division, three each in Gichugu and Mwea and two in Ndia. Most coffee groups were in Gichugu (10). Enterprises such as the production of dairy cattle, bananas, French beans, bee farming, maize and beans cut across the four divisions.

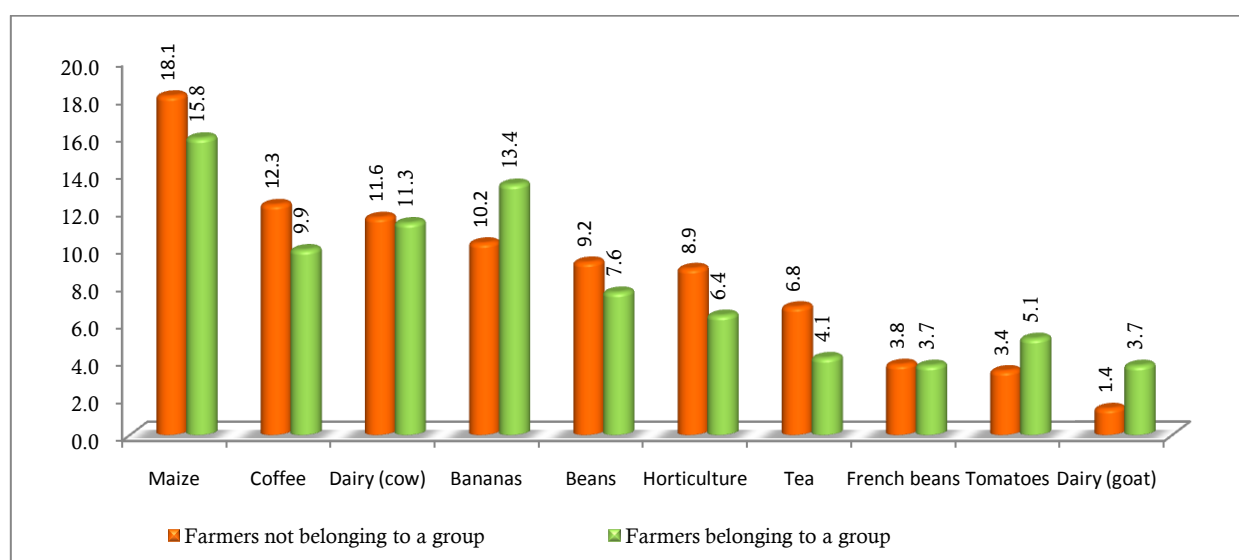
### 6.5.2 Main enterprises produced by individual small-scale farmers

Farmers belonging to a group and farmers not belonging to a group (71) produced a variety of enterprises on their farms. The ten most frequently cited enterprises produced by households of small-scale farmers are presented in **Figure 11**.

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<sup>67</sup> Irio is a Kikuyu word that means "food" but refers to a special nutritious Kikuyu dish made out of green peas or beans or pigeon peas, which are mashed together with potatoes, maize and a green leafy vegetable such as pumpkin or Stinging nettle. Irio is often served with *nyama choma* (grilled meat) or with stew and vegetables. Irio was originally a kikuyu dish but is now popular among other ethnic groups and nationalities.

Farmers belonging to a group (N=101, 486 responses) produced 43 enterprises individually. The five most frequently cited enterprises were the production of maize (77, 15.8%), bananas (65, 13.4%), dairy cattle (55, 11.3%), coffee (48, 10.0%), and beans (37, 7.6%) (see **Figure 11**). The full list of enterprises produced by small-scale farmers belonging to a group is presented in **Appendix 29**. The enterprises fell under the production of vegetables and melons (82, 16.9%), ruminants (79, 16.2%), cereals (79, 16.2%), fruit and nuts (76, 15.6%), beverage crops (68, 14.1%) and leguminous crops (58, 11.9%) (crops are grouped under the ICC classification). The results showed a large variation of enterprises produced in Kirinyaga district. This phenomenon could be explained by the varied agroecological and climatic conditions in the district (see **section 2.3.1**).



**Figure 11: Top ten enterprises produced by households of small-scale farmers**

N=101 for farmers belonging to a group, N=71 for farmers not belonging to a group

Other than the enterprises produced collectively as a group, the farmers belonging to a group produced (N=86) 56 enterprises individually (see **Appendix 30**). This percentage was much higher than the figure of 43 enterprises obtained from interviews with individual farmers belonging to a group (see **section 6.5.2**). Maize and beans were produced in all of the four divisions but mostly in Mwea, followed by Gichugu, while farmers in Mwea produced most of the rice, and farmers in Gichugu and Central produced most of the tea. As mentioned in **section 2.3.1.1**, Mwea is located in the lowlands and there are many permanent streams from the melting snow of Mount Kenya and rivers, which provide water for irrigation. The irrigation potential makes Mwea division more suitable for producing rice and varied horticultural enterprises, bananas and other crops compared to the other three divisions. The area is also hot, hence is suitable for the production of crops such as maize and beans that can mature faster than they would in the colder upland areas of Central, Gichugu and Ndia divisions.

Farmers not belonging to a group (N=71) produced fewer enterprises (31) than farmers belonging to a group (43). The 31 enterprises fell under the categories cereals (58 responses, 19.8%), beverage crops (56, 19.1%), vegetables and melons (49, 16.6%), fruit and nuts (38, 12.9%), leguminous crops (39, 31.3%), and ruminants (38, 13%) (crops are grouped under the ICC classification). The five most frequently cited enterprises were maize (53, 18.1%), coffee (36, 12.3%), dairy cattle (34, 11.6%), bananas (30, 10.2%), beans (27, 9.2%) and horticulture (26, 8.9%) (see **Figure 11**). **Appendix 31** lists the main enterprises produced by division.

There were variations between the enterprises produced by farmers' groups and individual households. The main enterprises produced by farmers' groups in order of ranking were TCB, maize, coffee, tree and fruit tree nurseries, French beans, dairy goat, dairy cattle, poultry, bee keeping, and tomatoes. On the other hand, the main enterprises of individual farmers were maize, bananas, dairy cow, coffee, beans, horticulture, tomatoes, French beans and dairy goat. There were some differences in the enterprises produced as households by farmers belonging and farmers not belonging to a group (see **Figure 11**). Farmers not belonging to a group produced more food crops such as maize and beans than farmers belonging to a group. On the other hand, farmers belonging to a group depicted higher figures for the newly introduced enterprises such as TCB bananas, dairy goats, and tomatoes than for farmers not belonging to a group. The main enterprises identified by the present study were similar to those identified by the RoK. Ministry of Finance and Planning (2002a:10), which included maize, beans, bananas, potatoes, coffee, tea, rice, horticulture and dairy cattle.

The higher percentages for the newly introduced enterprises such as dairy goats, TCB bananas and tomatoes for farmers belonging to a group indicated that groups fostered the adoption of new technologies. Maize and beans were produced in all of the four divisions but mostly in Mwea, followed by Gichugu, while farmers in Mwea produced the most rice. Data collected from focus group discussions with farmers showed that apart from the enterprises produced collectively as a group, farmers produced 56 enterprises individually. In contrast, data collected through interviews with individual farmers belonging to a group showed that farmers produced 43 enterprises. The inconsistency in the figures obtained demonstrate some of the disadvantages of triangulating sources of information, which can be viewed as advantageous in complementing, counteracting contrasts or biases and verifying data collected from alternative sources (see **section 6.5**) as outlined in **section 5.2**. The many enterprises produced demonstrate the agricultural potential of in Kirinyaga district and the diverse agroecological and climatic conditions in the different divisions.

The findings of the present study showed that more farmers belonging than not belonging to a group had adopted the newly introduced enterprises such as TCB bananas, dairy goats, and tomatoes implying that farmers' groups influenced the decisions made by individual members. More farmers

belonging than not belonging to a group were willing to experiment with new enterprises. Confirming the present study findings, Mishra and Swanson (2009:340) provided empirical evidence to demonstrate that technologies shared with members by group leaders in India were taken up by group members and their profits increased, whereas farmers who were not part of the project did not adopt the new enterprises. The findings of the present study, and Mishra and Swanson's (2009:340) point to the need to encourage and mobilise small-scale farmers to organise themselves into groups to increase adoption of new technologies by providing a platform for sharing and exchanging information and knowledge.

## **6.6 Criteria for ranking the main agricultural enterprises**

Farmers used different criteria for ranking the main agricultural enterprises presented above. Data for this section was collected through focus group discussions with farmers' groups and interviews with individual farmers belonging and not belonging to a group. The criteria used for ranking the agricultural enterprises presented above varied slightly among the different categories of farmers.

### **6.6.1 Criteria considered by farmers' groups in ranking the main enterprises**

In ranking their enterprises in order of priority, the farmers' groups (N=89) considered the amount of income or profit generated or the return on investment (65 responses, 25.3%), availability of good markets, market information and good prices (63, 24.5%), provision of food for subsistence and ensuring food security (51, 19.8%), and how fast an enterprise matured (25, 9.7%). Other criteria included the capital outlay and the cost of inputs required, the ease of management, provision of manure, health and nutritive value, land sizes, labour requirements, opportunities for value addition, conservation of the environment and soil fertility, availability of raw materials, feeds and fodder, irrigation water and credit, risk factors, whether the enterprise can be rotated or mixed, drought tolerance, and opportunities for creating employment (see **Appendix 32**). The groups preferred enterprises that grew fast, matured quickly and had a quick turn around, as this enabled them to earn money quickly (the shorter the duration the more crops produced per year). For example, the French bean enterprise was popular because it had a short duration to mature (about twelve weeks) and provided ready cash to the farmers.

### **6.6.2 Criteria considered by individual farmers for ranking enterprises**

Farmers belonging to a group (N=97) looked at criteria similar to those used by farmers' groups but used a different order of priority and considered fewer criteria compared to farmers' groups. As in the case of farmers' groups, the first criterion considered by farmers belonging to a group was the amount of income or profit generated (103 responses, 40.6%). The second was provision of food and ensuring food security (72, 28.3%), while the third criterion was how fast an enterprise matured (20, 7.9%), and availability of market came fourth (14, 5.5%). Others included climatic and agroecological



conditions, provision of manure, capital outlay and cost of inputs required, ease of management, conservation of the environment and soil fertility, access to credit, information, irrigation water, animal feeds and fodder, drought resistance and potential for crop rotation (see **Appendix 33**).

Data collected from 69 farmers not belonging to a farmers' group (N=69, 126 responses) corroborated the findings of farmers belonging to a group for the first two criteria. Informants explained that the enterprises given high priority were those who earned them good income and were profitable (42, 33.3%) and provided food (33, 26.2%). Some qualified that the enterprises ranked highly earned them income on an annual, monthly or daily basis. The third criterion was the availability of a market (18 informants, 14.3%), followed by how fast the enterprise matured (7, 5.6%). Other ranking criteria were similar to those presented above for farmers belonging to a group (see **Appendix 34**).

The findings of the present study revealed that the main criterion used by farmers' groups and individual farmers for ranking agricultural enterprises was primarily concerned with the amount of income or profit that the enterprise was likely to generate. While the second criterion for farmers' groups was availability of markets and marketing information, this criterion came third for farmers not belonging to a group, and fourth for farmers belonging to a group. As noted by The World Bank (2006e), markets were important because they were among the key drivers of change in agricultural development. The second criterion for individual farmers was provision of food and ensuring food security, which took third position under farmers' groups. The fourth criterion for farmers' groups and farmers not belonging to a group was the speed of maturity, which was ranked in third position by farmers belonging to a group. These findings suggest that generators of technologies and development partners introducing technologies need to take into consideration the amount of income or profit generated, availability of markets and marketing information, provision of food and food security and the speed of maturity of the enterprise. The criteria on land size was also important, considering that on average nationally, most farmers had land holdings of less than two acres (0.8 ha) (RoK. KNBS 2008b:342), while the average size of small-scale farms in Kirinyaga district was 3.1 acres (1.25 ha) (RoK. Ministry of Finance and Planning 2002a:10).

### **6.6.3 Ranking of the main agricultural enterprises using the criteria above**

Farmers' groups and individual farmers belonging and not belonging to a group were asked to list the main agricultural enterprises they produced and give an overall ranking in order of priority.

#### **6.6.3.1 Ranking of main enterprises by farmers' groups using the criteria above**

**Appendix 27** and **Appendix 28** show an overall ranking of the 51 enterprises cited by farmers' groups (N=88). The most important enterprises based on the overall ranking of enterprises ranked priority number one to five were the production of i) maize (29 responses, 13.1%), ii) coffee (22, 10%), iii)

bananas (20, 9%), iv) French beans (17, 7.7%), v) beans (15, 6.8%), vi) dairy goats (13, 5.9%), vii) dairy cattle (12, 5.4%) and viii) tea (10, 4.5%). Most groups worked collectively on only one enterprise, while others worked on two or more enterprises. This section presents findings on the key enterprise of farmers' groups.

**Appendix 35** presents results on the enterprises ranked priority number one to three by the groups. The findings showed that there were more groups that produced coffee and tea in Gichugu than the other three divisions. There were more groups producing maize in Mwea division than in Gichugu, Central and Ndia. Likewise, Mwea had more groups engaged in French beans, followed by Gichugu than the other divisions. In the case of the dairy cattle enterprise, there were more groups in Central and Gichugu, while rice was largely produced in Mwea division. The findings showed that farmers' groups mentioned 23 different enterprises as priority number one. Twenty (20) of the 23 enterprises were produced for cash and three for both cash and subsistence (maize, dairy cattle, bananas). Most of the enterprises ranked as priority number one were produced by mixed groups (58, 66.7%), followed by female only (19, 21.8%), male only (6, 6.9%) and youth only (4, 4.6%) groups (see **Appendix 36**).

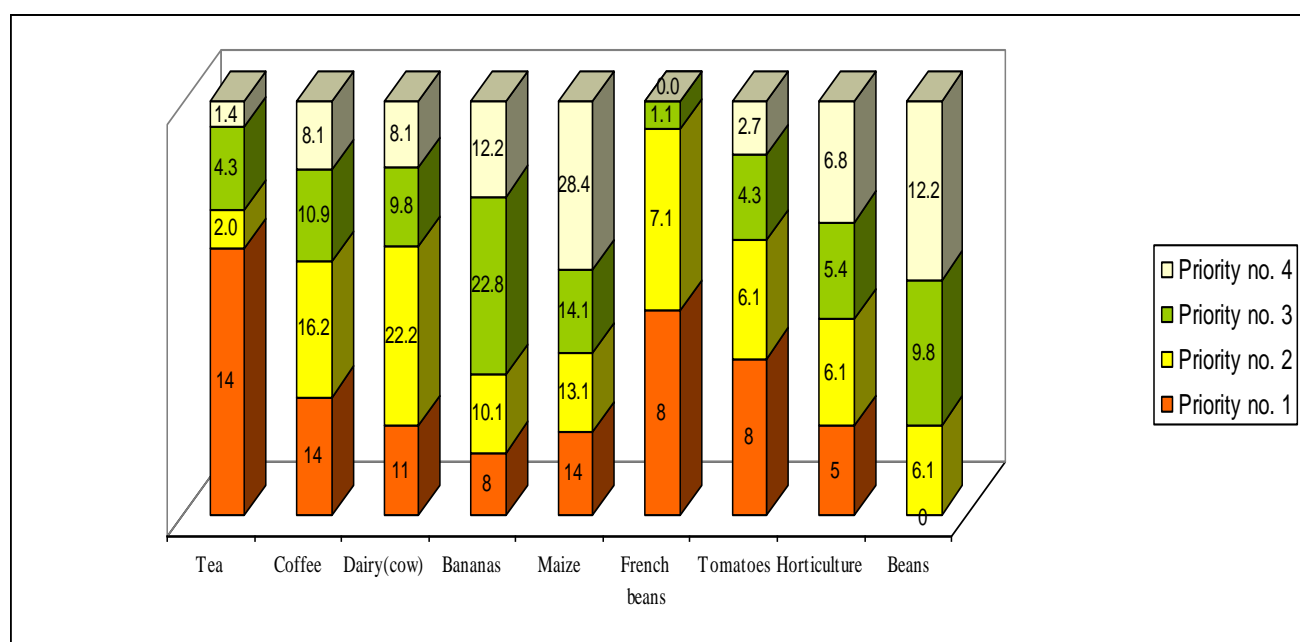
#### **6.6.3.2 Ranking of main enterprises of individual farmers using the criteria above**

This section presents findings on the main enterprises identified above (see **section 6.6**) by farmers belonging to a group using the criteria above. **Figure 12** summarises the main enterprises ranked priority number one to four by farmers belonging to a group. These comprised tea, coffee, dairy cow, bananas, maize, French beans, tomatoes and beans. The findings revealed that enterprises produced for cash generation such as tea, coffee, French beans were ranked higher in order of importance than enterprises produced for subsistence such as maize, beans and bananas.

These farmers belonging to a group (N=99) had as their main enterprises ranked priority number one tea, coffee, maize (14 responses, 14% each), dairy cattle (11, 11%), French beans, tomatoes and bananas. The enterprises were produced to generate cash, for subsistence and to produce manure for other enterprises. **Appendix 37** shows the full list of enterprises ranked priority number one and what they are used for. This category of farmers (belonging to a group) (N=99) listed 15 enterprises as priority number two for cash provision and for subsistence. The most important enterprises emerged as the production of dairy cattle (22, 22.2% each), coffee (16, 16.2%), maize (13, 13.1%), bananas (10, 10.1%), French beans (7, 7.1%), beans, tomatoes and horticultural crops (6, 6.1% each) (see **Figure 12** below). For the full list of enterprises ranked priority number two and what they were used for by farmers belonging to a group see **Appendix 38**.

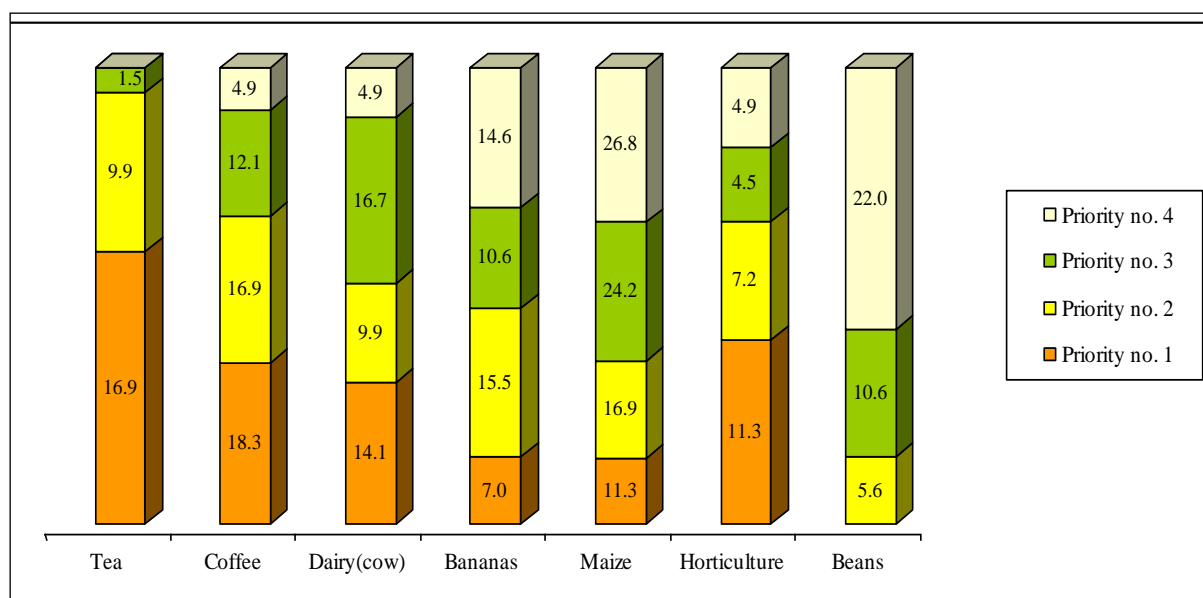


Individual farmers not belonging to a group were asked to name their main agricultural enterprises, they listed in **section 6.5.2** above, in order of priority in terms of importance for cash generation, subsistence or others. **Figure 13** below summarises the results of their four priority enterprises. The findings corroborated those of farmers belonging to a group and confirmed that the enterprises ranked with higher priority levels focused on income generation, while those given lower priority levels dwelt more on food provision (maize, beans and bananas). **Appendix 39** and **Appendix 40** present the full list of enterprises ranked priority one and priority two respectively.



**Figure 12: Enterprises ranked priority number one to four by farmers belonging to a group**

N=100 for the enterprise ranked priority number one, N=99 for the enterprise ranked priority number two, N=92 for the enterprise ranked priority number three, N=74 for the enterprise ranked priority number four



**Figure 13: Main enterprises ranked priority number one to four by farmers not belonging to a group**

N=71 for the enterprise ranked priority number one, N=69 for the enterprise ranked priority number two, N=66 for the enterprise ranked priority number three, N=41 for the enterprise ranked priority number four

The findings on the main enterprises based on the main criterion used by farmers' groups and individual farmers for ranking revealed that there were no major differences in ranking for main cash crops (tea and coffee) between farmers belonging to a group and not belonging to a group for the enterprise ranked priority number one. For subsequent enterprises the order of ranking by farmers belonging to a group were maize, dairy cow, French beans and bananas, while the ranking order by farmers not belonging to a group were dairy cow, horticulture, maize and bananas, confirming their criteria for ranking that focused on income generation and food. The emerging pattern showed that the enterprises ranked priority number two (maize in the case of farmers belonging to a group and dairy cow in the case of farmers not belonging to a group) appeared to be for food and for income (Munyua and Stilwell 2010:9). However, it appeared that farmers focused more on food crops for the enterprise ranked priority number four and three, where maize, beans, bananas were the priority enterprises under both categories of groups.

## 6.7 Summary

This Chapter highlighted the sociodemographic characteristics of small-scale farmers and provided answers to the research question on farmers' groups in place in Kirinyaga district, their characteristics and role in facilitating the sharing and exchange of knowledge and information among group members and with members of the community. The interactions between members yielded social

capital and when one member of the group learned about an idea, innovation, or technology, it was shared with other members of the group and community. The findings showed that some groups perceived information to be a private good and did not share beyond the group members. The non-sharing culture jeopardised the flow of information and learning, leading to information asymmetries.

# CHAPTER SEVEN: INFORMATION BEHAVIOUR OF SMALL-SCALE FARMERS

## 7.0 Introduction

Chapter seven presents and interprets the findings on **research objective one: Identify the information behaviour of small-scale farmers**. As outlined in the definition of key terms in the preliminary pages and discussed in more detail in **section 4.7.1**, information behaviour covers information needs, information seeking behaviour or avoiding information and use of the information (Wilson 1999:249). This Chapter sought answers on the information behaviour of small-scale farmers stratified by gender, their information needs, how they went about seeking agricultural information and knowledge, and the role of farmers' groups in facilitating the sharing and exchange of knowledge and information (external and local) in light of information behaviour theories and their underlying paradigms. The Chapter establishes the reasons why farmers needed additional advice, information and knowledge on technologies or about the farming methods they wanted to adopt or improve, why they shared information and knowledge (external and local) and the reasons for sharing. Finally, this Chapter discusses how and why farmers merged external and local knowledge, reasons for combining this knowledge, their feelings and emotions about mixing it and the barriers and constraints encountered while doing so.

## 7.1 The agricultural information needs of small-scale farmers

This section aimed to answer the **research question 1.1: *What are the information needs of small-scale farmers (men, women and the youth)***? Data on the agricultural information needs of small-scale farmers was collected through focus group discussions with farmers' groups and interviews with farmers belonging and not belonging to a group (men, women and the youth).

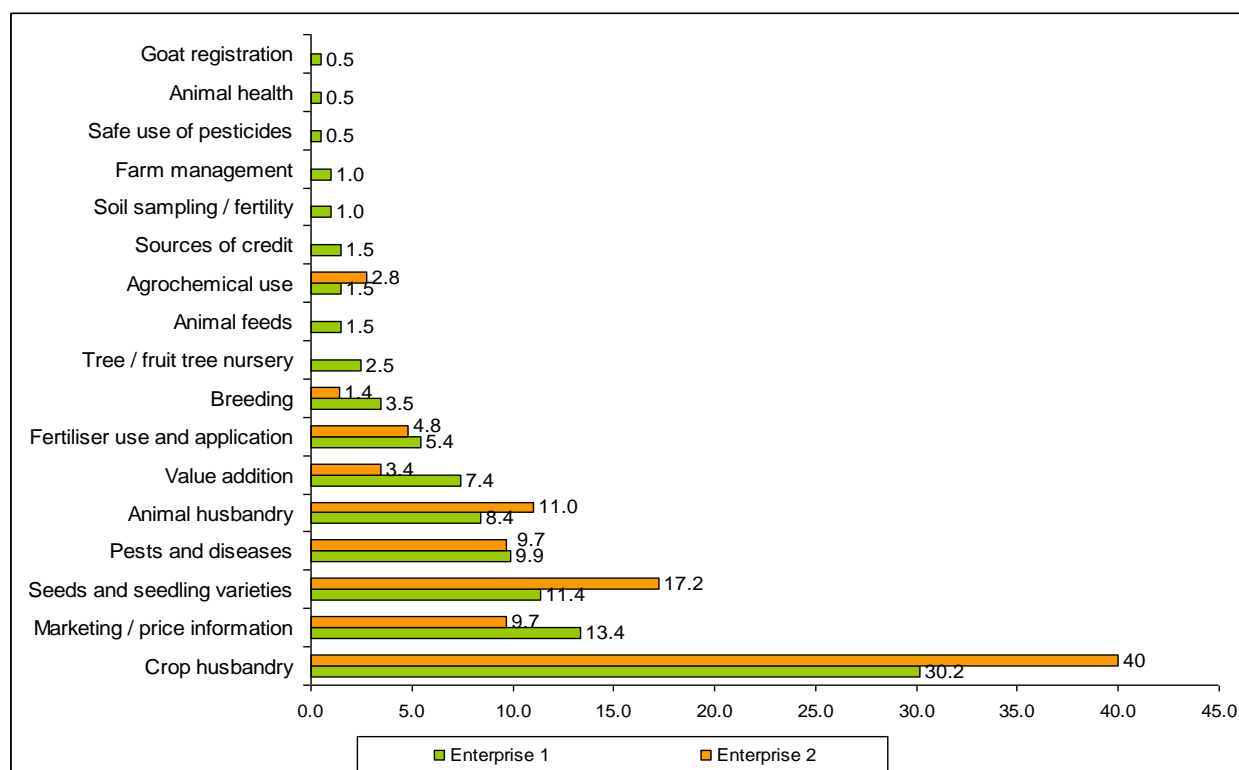
### 7.1.1 Information needs of farmers' groups

The information needs of farmers' groups depended on the enterprise(s) adopted by the group and the purpose(s) for which the information was needed, such as to introduce a new technology or farming method, to respond to a particular farming question, for general agricultural information, or for the group's enterprise(s) identified above.

#### 7.1.1.1 Information needs of farmers' groups for the enterprises ranked priority number one and two

For the main enterprise ranked priority number one (see **section 6.6**), farmers' groups needed information on a range of activities on the agriculture value chain. Following the steps on the production to consumption continuum, results showed that farmers' groups (N=87 for the enterprise

ranked priority number one) needed agricultural information on crop husbandry (61 responses, 30.2%), animal husbandry (17, 8.4%), seed varieties and seedlings (23, 11.4%), and pests and diseases (20, 9.9%), agrochemical use (3, 1.5%), fertiliser use and application (11, 5.4%), animal feeds (3, 1.5%), animal health (1, 0.5%), value addition (15, 7.4%) as well as marketing and prices (27, 13.4%). Other needs included sources of credit, breeding, soil sampling and fertility, farm management and goat registration. Data collected on the information needs for enterprises ranked priority number two corroborated the results obtained above for the enterprise ranked priority number one (see **Figure 14**).



**Figure 14: Information needs of farmers' groups for the enterprises ranked priority number one and two**

N=87 for the enterprise ranked priority number one, N=73 for the enterprise ranked priority number two

**Figure 14** shows that the groups had a broader variety of information needs for their main enterprise ranked priority number one than for the enterprise ranked priority number two. Apart from the common needs cited for both enterprises, the groups needed additional information on soil sampling and fertility, appropriate seeds or breeds, safe use of pesticides and animal health to satisfy their needs for the enterprise ranked priority number one. However, the results revealed that there were higher percentages for the needs expressed for the enterprise ranked priority number two than for the enterprise ranked priority number one on crop husbandry, seeds and seedling varieties, animal husbandry and agrochemical use. This was probably because most groups shared a common interest

in one enterprise, on which the group leaders invested much time and effort identifying sources and acquiring information on behalf of the group. This implies that individual farmers had to find information to satisfy their needs for the enterprise ranked priority number two and other enterprises.

#### **7.1.1.2 Information needs on technologies or farming methods that farmers' groups would like to introduce or improve but do not have information about**

Farmers' groups (N=89) were asked to state whether they needed any particular kinds of information or advice or training on agricultural activities that they would like to introduce or improve but did not have information about. Eighty one (81 responses, 91%) responded yes. The groups that answered yes needed information, training and advice on 28 different enterprises, crop production (45, 27.6%) (including TCB, apples, Soya beans, onions, egg plant, cucurbits, mushrooms, coffee, maize, tomato, avocado, horticulture, cotton and sunflower), animal production (34, 20.9%) (including the keeping of poultry, dairy goat, dairy cattle, rabbit rearing, pigs, fish farming and bee keeping), value addition (17, 10.4%) (pork and honey processing, avocado soap making and oil extraction, jam making and storage) and marketing and price information (16, 9.8%).

An analysis of the information needs for which the groups (N=83) did not have information about by type of group showed that (see **Appendix 41**):

- i) Most of the male only and female only groups needed information on crop husbandry, animal husbandry, value addition, and marketing and prices.
- ii) The female only groups depicted a broader range of needs than the male only and youth only groups. An observation made by one key informant that women carried out more farming activities than the men and youth was a likely explanation for this phenomenon.
- iii) The youth only groups needed information on crop husbandry and farm management, and presented the narrowest range of needs compared to the other types of groups.
- iv) The mixed groups expressed the broadest range of needs but mainly needed information on crop husbandry, animal husbandry and marketing and price information.

#### **7.1.2 Information needs of individual farmers**

This section presents the information needs of individual farmers for their major enterprises and technologies or production methods they would like to introduce but do not have information about.

##### **7.1.2.1 Information needs for the major enterprises of individual farmers**

Data from interviews with farmers belonging to a group (N=101, 208 responses) on the information needs for enterprises ranked priority number one showed that farmers needed information on 15 different enterprises. For each of the enterprises, farmers needed information on (arranged in order of the value chain from production to consumption) crop husbandry (57, 27.4%), animal production

(38, 18.3%), pests and diseases (26, 12.5%) markets and prices (34, 11.5%), seed varieties and seedlings (21, 10.1%). Other needs were agrochemical and fertiliser use and application, value addition, soil sampling and fertility, nutrition, farm management, good agricultural practices, farming systems, manures and compost, and tree and fruit tree nurseries.

Similar results were obtained for farmers not belonging to a group (N=71 groups, 159 responses) for the enterprise ranked priority number one. A comparison of findings for the two categories of individual farmers showed that the percentages for animal production were relatively much lower for farmers not belonging to a group than for farmers belonging to a group (5.7% versus 18.3%). This may be because most farmers rearing animals such as dairy goats, chickens, rabbits or bees belonged to some sort of farmers' group even if they were not formalised. The figures for market and price information, agrochemical usage and value addition were higher within the category of farmers belonging to a group than those not belonging to a group.

Results from farmers belonging to a group on the information needs for the enterprises ranked priority number two, three, four and five demonstrate a similar pattern to that for the enterprise(s) ranked priority number one. As in the case of farmers' groups, farmers belonging to a group had a wider variety of needs for the enterprise ranked priority number one than for the enterprises ranked priority number two to five. The results for farmers not belonging to a group confirmed the trend observed for farmers belonging to a group.

An analysis of information needs by type of group revealed that mixed groups had the broadest range of needs, followed by female only, male only and youth only groups. The narrow range of needs expressed by youth groups was possibly because of their inexperience in farming which limited their range of needs, and secondly because for most youth, farming was a transitory step as they awaited opportunities for apprenticeships, further education or jobs in urban areas.

A gender analysis of the information needs for farmers belonging to a group (N=101) for the priority number one enterprise showed that there were more male than female farmers who needed information on (percentages within gender) crop husbandry (32, 56.1% versus 25, 43.9%), animal husbandry (24, 63.2% versus 14, 36.8%), pests and diseases (20, 76.9% versus 6, 23.1%) and markets and prices (16, 66.7% versus 8, 33.3%), which were the top areas of needs. Results in **Appendix 42** demonstrated a similar trend for information on pests and diseases, seeds and seedling varieties, fertiliser use and application and good agricultural practices and farming systems. However, there were equal numbers of male and female farmers who needed information on agrochemical use, and soil sampling and fertility. The findings for farmers not belonging to a group (N=71) corroborated

those of farmers belonging to a group but depicted equal numbers of male and female farmers for information on fertiliser use and application.

The present study established that all categories of farmers had diverse and dynamic agricultural needs on the value chain from production to consumption. This finding was consistent with that of other authors (Aina 1995:203; Nyankanga *et al.* 2004:143; Byamugisha *et al.* 2008:97). Farmers needed information on plant and animal husbandry, seeds and seedling varieties and breeds, pests and diseases, fertiliser and agrochemical use, value addition and marketing. The findings of the present study on the needs of farmers for the major enterprises partially concur with Wilson's 1999 general model of information behaviour. The model depicts the information needs and circumstances of the users (farmers) and the environment in which the individual farmers or groups operated (Wilson 1999:256,262; 2006a:682; Case 2002:118-119,128). Various authors have shown that farmers need information on technical, commercial (including markets), socio-cultural and legal aspects (IFAD 2002b:54; Pretty and Wesseler 2004:9; Morris 2007:16). The high proportion of farmers who expressed the need for information on crop production could be explained by the high proportion of farmers who were engaged in crop farming in Kenya. According to the RoK. KNBS (2008b:347), 90.6% and 92.9% of the poor and non poor households in Kirinyaga district practiced crop production. The information needs of farmers depended on the specific enterprise(s) that farmer(s) produced and the geographic location (Munyua and Stilwell 2010:9).

The needs identified by the present study were in agreement to those established by many authors in other African countries (Kaniki 1989:126; Kiondo 1998; Garforth *et al.* 2003:2; Morris 2007; Byamugisha *et al.* 2008:97; Chilimo 2008:262). In Tanzania, Matovelo, Msuya and De Smet (2006:259) identified crop diseases, rodent infestation, credit, chicken diseases, livestock diseases and markets as the main information needs of smallholders. Farmers in Uganda indicated they needed information on education, new skills, health, government information, tourism, market opportunities and modern farming techniques, agroprocessing, post-harvest handling, sources of inputs, fertilisers and manures, animal health, credit, soil management, agroforestry and agricultural implements or machinery (Kayabwe and Kibombo 1999:12-13; IDRC 2004). In addition, farmers expressed the need for information on the weather (Weiss, Van Crowder and Bernardi 2000:185-186), on competing imports, incentives and government policies (Chisenga, Entsua-Mensah and Sam 2007:7). These findings showed that farmers had diverse needs that were multidisciplinary and imply the need for availing farmers of a broad range of development information to address their agricultural and non agricultural information needs in areas such as meteorology, health, education and tourism. In the context of AKIS, the findings suggest a need for establishing linkages with actors in other sectors to ensure the information needs of rural producers are met. Although the findings were generalised under groups and individual farmers, needs depended on the geographic location, target group,



education, and social setting (Kaniki 1989:73; Mchombu *et al.* 2001:187; Ikoja-Odongo and Mostert 2006:153,156).

The present study depicted similar topics identified by males and females and the main differences observed were: i) there were higher proportions of male than female farmers who expressed the need for information on crop husbandry, animal husbandry, pests and diseases, marketing and price information, seeds and seedling varieties, fertiliser use and application and good agricultural practices; ii) the female only groups expressed a broader range of needs than the male only and youth only groups. The finding on more female than male farmers seeking information from elders was confirmed by Mchombu (1993), who found that most women obtained information from friends, relatives and village leaders. Moreover, results obtained under **section 7.1.2.2** below confirmed that male and female farmers expressed information needs on similar topics on new technologies or production systems, but their order of priority of needs differed. However, as discussed later in **section 7.2**, there were gender differences in information seeking behaviour. According to Garforth's (2001a) study in Eritrea, there was a marked gender split in the topics cited by men and women. Likewise, other authors (Mchombu 1993; Kiondo 1998) found that male and female farmers had different information needs. However, the findings of the present study, and those by Oladokun (1994) in Nigeria were not in full agreement with Mchombu (1993), Kiondo (1998), and Garforth (2001a).

#### **7.1.2.2 Information, advice or training needs on technologies or farming methods that individual farmers would like to introduce**

Small-scale farmers belonging to a group were asked whether there was any particular kind of agricultural information, advice, or training that they needed on a technology or production system that they would like to introduce but did not have sufficient information about. Most of the informants ((84, 84.8% farmers belonging to a group (N=99) and 63, 88.7% farmers not belonging to a group (N=71)) answered yes. Findings from informants who answered yes (farmers belonging to a group (N=81) and farmers not belonging to a group (N=52)) corroborated the results obtained above for information needs of farmers' groups (see **Appendix 43**).

A comparison of the results from the two categories of individual farmers revealed that there were more farmers belonging to a group than farmers not belonging to a group who expressed needs for information, training and advice on crop husbandry (34% versus 33.3%), animal husbandry (27.8%, versus 14.4%) and value addition (9% versus 3.3%) respectively. However, the figures were higher for farmers not belonging than belonging to a group on needs for information on new technologies and improved farming methods (8.9% versus 0.7%).

Male and female farmers expressed similar needs for information on new technologies or production systems. However, while the priority needs for farmers belonging to a group (N=81) for male farmers were crop husbandry, followed by animal husbandry then value addition, the priority needs for females were animal husbandry followed by crop husbandry then value addition. The priority needs for male farmers in the category of farmers not belonging to a group (N=52), were crop husbandry, animal husbandry and new improved technologies and methods, followed by pests and diseases, while the priorities for the female farmers were crop production, animal production and seeds and seedling varieties (see **Appendix 43**).

The findings of the present study showed conspicuous disparities between the available information, and information on new technologies and farming methods that farmers would like to introduce. A significant majority of 84.8% farmers belonging to a group and 88.7% farmers not belonging to a group indicated that they needed specific kinds of information, advice or training on a technology or production system that they would like to introduce but did not have sufficient information about. The slightly higher percentage of farmers not belonging than belonging to a group imply a slightly bigger gap in knowledge by farmers not belonging to a group. This phenomenon is partially explained by the advantages that farmers belonging to a group had over farmers not belonging to a group. The former had greater access to training opportunities because most information providers provided training through the group approach. Farmers not belonging to a group thus needed more information, training and knowledge than farmers belonging to a group.

These findings have implications for information service provision and research and highlighted the need to repackaging and disseminate information on new technologies and farming methods to farmers along gender lines, to ensure a fit between the needs of farmers and the available information. Information needs of farmers were dynamic (Kaniki 1989:73; Bawden 2006), and farmers constantly needed new information to make decisions on alternative enterprises, technologies or farming methods. A study conducted by Easdown and Starasts (2004) in Australia found that there was a mismatch between the information provided on the internet that was aimed at farmers and the information that farmers actually needed to make decisions. The findings of the present study and those of other authors (Easdown and Starasts 2004) suggest a need to conduct regular needs assessments (Kaniki 1994a:53), and to involve the local people (Mchombu 2004:34; Bringe 2008:24), to ensure that the current needs of farmers were constantly captured, updated and met.

### **7.1.3 Reasons why small-scale farmers needed additional information on technologies or farming methods and reasons for not having it**

Farmers' groups and individual farmers cited various reasons why they needed advice, information and knowledge on new technologies or farming methods.

### 7.1.3.1 Why farmers' groups needed additional information on technologies or farming methods

**Figure 15** shows that 51 groups (51%) wanted to raise production, yields and profits (N= 78, 100 responses). Others wanted to acquire skills and knowledge to enable them to adopt new or improved technologies and farming methods such as mushrooms, apples, TCB, improved breeds of dairy goat and cattle, new rice and coffee varieties (12, 12%), to diversify enterprises and reduce risks (11, 11%).

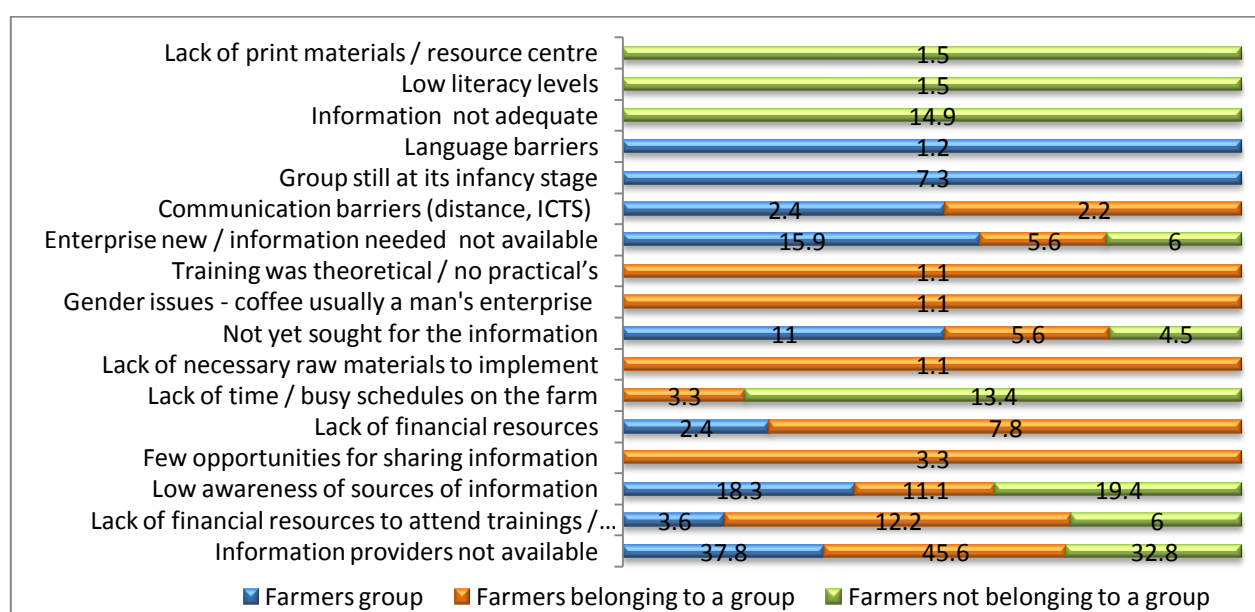


**Figure 15: Reasons why farmers' groups needed additional information on technologies and farming methods**  
N=78

The main reasons why farmers' groups needed additional information on technologies and farming methods included increased production, income and profit, to inform decisions on the adoption of new or improved technologies and farming practices, to reduce poverty, to improve the standards of living, create employment, and to improve prices and markets. In addition, Leckie (1996:298) pointed out that the key reason why farmers needed additional information on technologies and farming methods was because information, like land, labour and capital was a requisite production factor. The finding of the present study on the need for additional information to acquire skills and knowledge was supported by Leckie (1996:298) who stated that farming required "life-long learning and life-long access to information and knowledge resources." The many changes in restructuring of agriculture called for complex decision making and innovation regarding new technologies and requirements for associated production factors such as labour and credit, as well as expertise and information to keep pace with input requirements in their operational activities. Both the present study and Leckie's (1996:298) indicate that there was a need for regular provision of current, comprehensive and accurate information.

### 7.1.3.2 Reasons farmers' groups and individual farmers did not have the additional information they needed on technologies and farming methods

The main reasons cited by farmers' groups (N=82, 90 responses) for not having enough information on technologies or farming methods included limited availability of information providers (31, 37.8%), not knowing where to get the information needed (15, 18.3%), the enterprise, technology or idea was relatively new to the group hence they needed information on it (8, 9.8%) while some had not sought information or looked for experts (9, 11%). Other reasons cited included the groups being relatively new hence not having embarked on information seeking, inadequate financial resources to attend training, information needed not being available, communication barriers such as distance and ICT infrastructure and language barriers (see **Figure 16**). Farmers belonging (N=76, 90 responses) and not belonging to a group (N=54, 67 responses) cited similar reasons as those given by farmers' groups, but the weight of ranking varied (see **Figure 16**).



**Figure 16: Reasons why farmers did not have sufficient information on technologies or farming methods they wanted to introduce or improve**

N=78 for farmers' groups, N=76 for farmers belonging to a group, N=54 for farmers not belonging to a group

The findings of the present study showed that there was insufficient technical information in Kirinyaga district. This finding was similar to that of Morris (2007:17), whose study on the agricultural information needs of various categories of users in South Africa showed a conspicuous gap between the needs of users for technical information from research and the resources available. The findings showed that the key reason why most farmers did not have sufficient information and

knowledge on technologies and farming methods they needed was that information providers were not available. The limited availability of extension officers for example resulted from downsizing of extension services (Tire 2006:35; The World Bank 2006a), insufficient resources, staff, and insufficient communication skills (The World Bank 2010a:18). These findings imply that there is a need to increase the number of extensionists and other information providers in rural areas. The finding on low literacy levels was supported by Kaniki (1994b:35,38), who identified a link between insufficient information and skills. He suggested the need for specialist training and continuing education for information provision to rural communities. The finding of the present study on insufficient information being available to farmers was supported by many authors (Tripp and Pal 2000:139,142; Onderstesteijan, Giesen and Huirne 2003:37,50; Stefano *et al.* 2005b; Chilimo 2008:260), some of whom observed that education played a role in motivating information seeking although they pointed out that results on relationships between education level and information behaviour were inconclusive.

Another cause of insufficient information was low awareness of information and the content being too technical. Tripp and Pal (2000:139,142) found that farmers in India were not familiar with the technical names of inputs and varieties and this limited their capacity to ask for appropriate inputs, and information provided by seed companies was shallow. Tripp and Pal (2000) suggested the need to improve the quality of information disseminated by packaging content that respond to the target group being served. Likewise, Ofuoku, Emah and Itedjere (2008:561) found that fish farmers found it difficult to understand technical information they obtained from intermediaries. Another reason identified by the present study and other authors (Leach 1999:81; Ofuoku, Emah and Itedjere 2008:559) was not having sufficient time to seek information because of the many tasks they had to attend to on the farm. Ofuoku, Emah and Itedjere (2008:559) found that young fishermen in Kenya did not have adequate time to undertake information activities. Other reasons identified by the present study included the information needed was not locally available, and farmers did not have sufficient resources to attend training. These findings imply that there is a need to address the gaps, barriers and constraints that farmers faced in obtaining agricultural information on new technologies and farming methods.

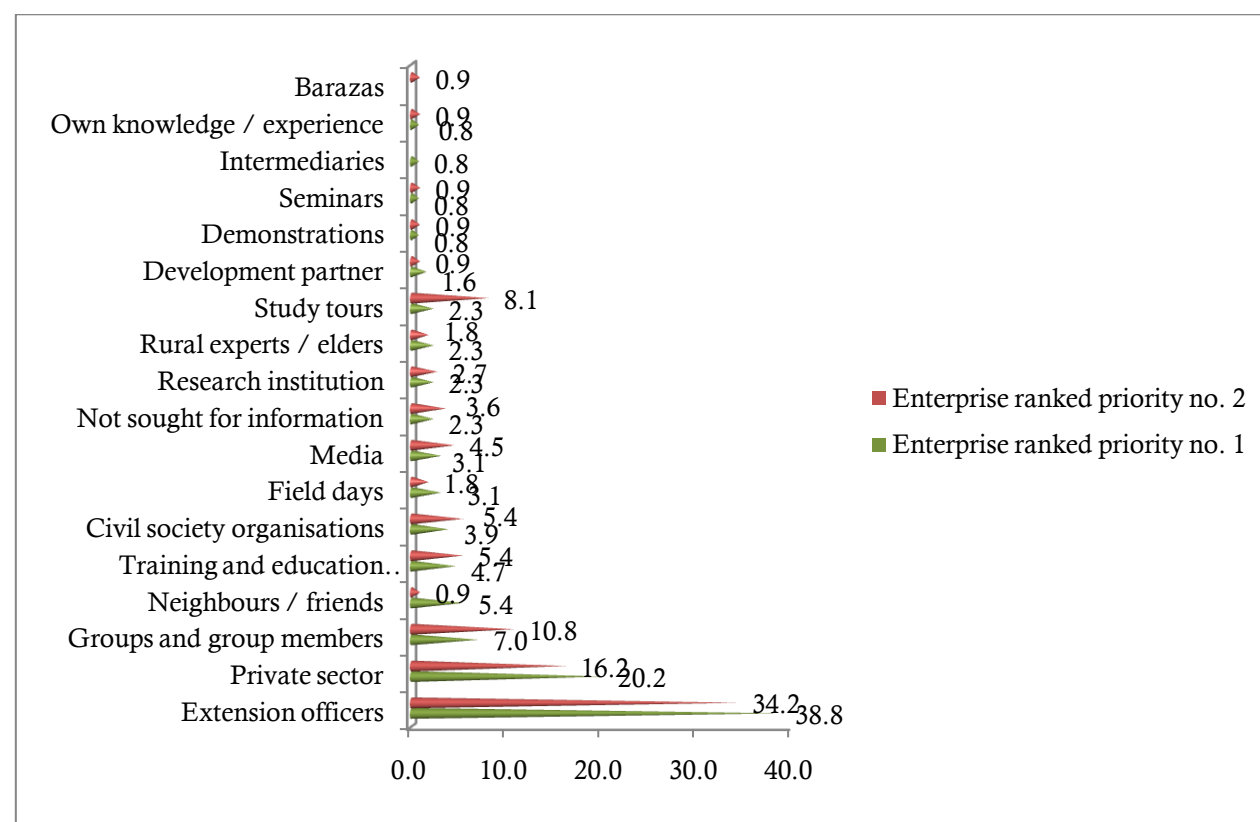
## **7.2 Information seeking behaviour of small-scale farmers**

This section responds to the **research question 1.2: *How do small-scale farmers go about seeking information and knowledge (men, women and the youth)?*** and focuses on the seeking behaviour of farmers' groups and individual farmers belonging and not belonging to a group for agricultural information. As explained in the definition of key terms in the preliminary pages, information seeking encompasses the searching behaviour and the use of information. However, results on the

usage of information are presented in **Chapter ten**. As noted in **section 4.7.1.2**, the literature reflects that small-scale farmers had various information seeking behaviours.

### 7.2.1 Information seeking by farmers' groups

Responsibility for collecting information for farmers' groups (N=79) rested with the group leaders (61, 77.2%), but individual farmers (15, 19%) and selected group members (2, 2.5%) also collected information. **Figure 17** shows how farmers' groups sought information for the enterprises ranked priority number one (N=84, 129 responses) and number two (N=70, 111 responses).



**Figure 17: How farmers' groups sought agricultural information and knowledge for the enterprises ranked priority number one and two**

N=84 for enterprise one, N=70 for enterprise two

Farmers' groups mainly sought information and knowledge through visiting or inviting visits by extension officers, phoning or inviting or visiting individuals and institutions, participating in study tours, working with CSOs and listening to the radio (percentages presented below represent the enterprises ranked priority one versus the enterprise ranked priority number two respectively): i) Visiting or inviting visits by extension (agricultural, livestock, forest) officers (38.8% versus 34.2%). The groups either invited the extensionists to their group meetings or representatives of the groups visited the officers in their offices and brought the information required back to the group. ii) Calling or inviting or visiting individuals and institutions in the private sector (20.2% versus 16.2%) to train

group members or to provide information. These included horticultural exporting companies, seed companies, agrochemical companies, private veterinary officers, agrovets or societies or factories that processed coffee, tea and cotton. In some instances, group representatives consulted input stockists in their shops or veterinary officers in their clinics by phoning or in person. Others selected group members whom they sent to the companies, or representatives or experts from companies visited farmers' groups and trained them. iii) From groups and group members (7% versus 10.8%).

**Figure 17** presents other ways in which farmers' groups sought information. It was noted that 8.1% of the farmers' groups sought information for the enterprise ranked priority number two through study tours, which came fourth in importance. Neighbours, friends and relatives came fourth for the enterprise ranked priority number one. One farmers' group remarked, "We prefer to ask family members and close relatives because they are honest and open and will not withhold any information." In some cases, representatives of the groups attended training or meetings of other groups, or invited other groups to their meetings or training. A few groups had not sought information, while one group said they relied on previous experience and knowledge.

There were variations in the manner in which farmers' groups (N=70) in different geographical locations sought agricultural information. For example, the results for the top three sources from where farmers' groups sought information showed that i) thirteen groups (13, 34.2%) in Mwea division sought information from extension, while the figures for the other divisions were 11 (28.9%) each for Central and Gichugu and 3 (7.9%) for Ndia. ii) Most groups that sought information from the private sector were from Mwea division (8, 44%), followed by Gichugu (4, 22%) and 3 (16.7%) each for Central and Ndia divisions. iii) There were more groups that sought information from other farmers' groups and group members in Gichugu and Mwea divisions (4, 33% each) than Ndia (3, 25%) and Central (1, 8.3%). The results also showed that there were more groups that sought information from training and education institutions from Gichugu (3, 50%) than Mwea (2, 33%), Ndia (1, 16.7%) and none in Central division. This was probably because the Kamwet Agricultural Training Centre (KATC) was located in Gichugu division hence groups around the division found it easier to access the centre.

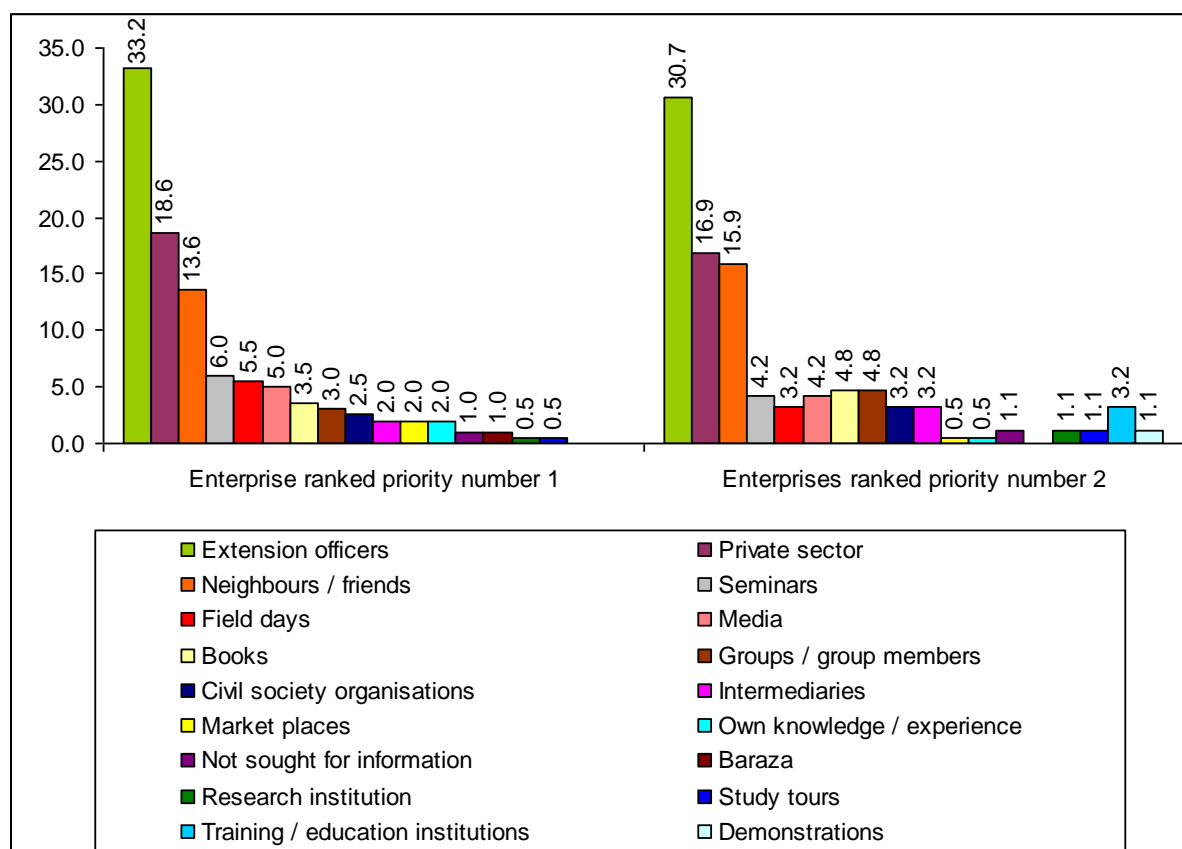
### **7.2.2 Information seeking by individual farmers**

This section presents the seeking behaviour of farmers belonging and not belonging to a group for specific enterprises and when looking for information on a new technology or farming method that they would like to introduce or improve.



### 7.2.2.1 Farmers belonging to a group

Small-scale farmers belonging to a group were asked to state how they sought information for the enterprises ranked priority number one (N=101 farmers, 199 responses) and number two (N=95, 189 responses) respectively. **Figure 18** depicts the ways in which farmers belonging to a group sought information for the enterprises ranked priority number one and two.



**Figure 18: How farmers belonging to a group sought information for the enterprises ranked priority number one and two**

N=101 for the enterprise ranked priority number one, N= 95 for the enterprise ranked priority number two

Farmers belonging to a group mainly sought information through (percentages given below represent the enterprise ranked priority number one versus the enterprise ranked priority number two):

- Visiting extension officers in their offices or inviting them to their group meetings (66, 33.2% versus 58, 30.7%).
- Consulting experts in the private sector. The experts included input stockists, private veterinary clinicians, the KTDA, coffee factories, millers, milk processing companies, cut flower companies, cotton ginnery and agrochemical companies (37, 18.6% versus 32, 16.9%).
- Consulting neighbours and friends or relatives (27, 13.6% versus 30, 15.9%).



A few individuals indicated that they had not sought any information. Findings for the enterprise ranked priority number two were consistent with those obtained for the enterprise ranked priority number one, except that there were more informants who sought information from groups and group members than in the case of the enterprise ranked priority number one (9, 4.8% versus 6, 3%). In addition to the seeking behaviour observed for farmers' groups, individual farmers belonging to a group also used personalised methods such as listening to the radio, watching TV, reading books, magazines, manuals and newsletters, attending shows, conferences and barazas to obtain information (see **Figure 18**).

A gender analysis of the information seeking behaviour of farmers belonging to a group (N=101) for the enterprise ranked priority number one showed that there were no major differences in the manner in which male and female farmers sought information for the enterprise ranked priority number one. Most farmers belonging to a group (male and female) sought information from extension officers, followed by the private sector then neighbours. A close analysis of the numbers of male and female farmers who sought information for the enterprise ranked priority number one revealed that there were more male than female farmers who sought information from extension officers (male versus female percentages within gender) (45, 68.2% versus 21, 31.8%), the private sector (23, 62.2% versus 14, 37.8%), neighbours (18, 66.7% versus 9, 33.3%), seminars, field days, media, books, as well as barazas, study tours, and CSOs. However, there were more female than male farmers who sought information from farmers' groups and group members, and equal numbers of male and female farmers who relied on their own knowledge and experience. A small minority indicated that they had not taken any action to seek information.

#### **7.2.2.2 Farmers not belonging to a group**

Results for farmers not belonging to a group for the enterprise ranked priority number one (N=69, 118 responses) and two to five (N=69 farmers, 112 responses) respectively showed similar information seeking patterns as those obtained for farmers belonging to a group and for farmers' groups but they could not invite information providers to come to their farms because they were not organised in groups, hence had to go out to find information providers. Farmers not belonging to a group mainly sought information for the main enterprise through visiting extension officers in their offices, consulting experts in the private sector, and asking neighbours, other farmers, friends or relatives. A few sought information and knowledge from farmers' groups or group members for the enterprise ranked priority number one. The results also suggest that farmers not belonging to a group sought information from more diverse sources for the enterprises ranked priority number one than for the enterprises ranked number two to five (19 sources versus 15 sources).

Findings for farmers not belonging to a group on the analysis of information seeking behaviour for the enterprise ranked priority number one by gender corroborated those obtained for farmers belonging to a group, and showed more male than female farmers for all the information seeking approaches. The pattern for the enterprises ranked priority number two to five indicated that farmers (male and female) mainly sought information from extension officers (34, 30.4%), neighbours (23, 20.5), and the private sector (18, 16.1%). These findings imply that there were more farmers not belonging to a group that sought information from neighbours, relatives and friends than the private sector for the enterprises ranked priority number two to five. A gender analysis for the enterprises ranked priority number two to five corroborated the findings obtained for the enterprise ranked priority number one, but there were more female farmers who obtained information from rural experts, elders and parents than male farmers. As in the case of farmers belonging to a group, a small percentage had not sought information.

An analysis of the information seeking behaviour of the three categories of farmers showed that most farmers sought information from 'people' sources. This suggests that information providers need to put more emphasis on oral communication channels. Extension officers emerged the key source of information for the main enterprises that small-scale farmers in Kirinyaga district produced. Most farmers belonging to a group obtained information for their main enterprises from extension officers, the private sector through their farmers' groups and neighbours, friends and relatives. On the other hand, most farmers not belonging to a group obtained information for the enterprises ranked priority number one to five from extension officers, followed by neighbours, friends and relatives, then the private sector. This finding has implications for the extension service in Kenya and suggests the need to strengthen the capacity of extension officers (in terms of numbers and resources) to meet the needs of farmers. Apart from seeking for information from extension and the private sector actors, the findings for both categories (belonging and not belonging to a group), and other authors (Mchombu 1993; Kiondo 1998:209; Byamugisha *et al.* 2008:97) underscored the importance of neighbours, relatives and friends. As noted by one group, some farmers perceived family members to be more honest and open than neighbours in sharing information. This finding was supported by Leckie (1996:303) who posited that family members and close relatives were the key source of agricultural information of female farmers because they provided an environment of ease, safety and tolerance, hence they could ask any questions without fear and learn by making mistakes and being corrected.

Mchombu (1993) and Kiondo (1998:209) found that most women obtained information from friends, relatives and village leaders, while Ngimwa, Ocholla and Ojiambo (1997:53), showed that most rural women in Kinangop, Nyandarua district, Kenya obtained information from friends, followed by professionals such as extension workers, relatives and mass media. As noted by Chan and Elder (2001:38-39), family, and parents in particular played an important role in involving their children in

farming activities and demonstrated a form of social capital, and the success of parents in farming helped to shape the choices made by the youth.

The findings of the present study (see **sections 7.1 and section 8.3.2**) supported those of Garforth *et al.* (2003:3) that neighbours were very important actors and the “horizontal communication” between them facilitated sharing and exchange of ideas and information. The present study showed that there were many innovative model farmers in Kirinyaga district, such as those who adapted the nine-seeded hole technology<sup>68</sup> to six holes, or those who used rice ratoons and low yielding rice plants for fodder, who were knowledgeable and experienced, and shared experiences and ideas with fellow group members and neighbours. However, some group members perceived that some neighbours withheld information from others because they were jealous of their success.

An analysis of the main actors where farmers in Kirinyaga district sought information revealed that farmers frequented interpersonal sources that were convenient and accessible, such as field extension officers, who were in their locations and sub-locations, the private sector actors who worked with farmers and groups around their farms and neighbours, relatives and friends because of their proximity. These findings were congruent with other authors (Rees *et al.* 2000:4; Stefano *et al.* 2005b; Morris 2007:23). Rees *et al.* (2000:4), found that farmers mainly used agricultural information and knowledge from local sources, and Stefano *et al.* (2005b), established that farmers in South Africa tended to use sources that were accessible, credible and understandable. Morris (2007:23) found heavy reliance on interpersonal contacts and networks. This information seeking phenomenon confirmed the Principle of Least Effort theory or model (Poole 1985:89-92; Case 2002:141; Bates 2005:4), that explained that people invested minimum time, energy and money by using sources that were convenient, readily accessible, easy to use and required least effort (see section 3.2.4.1). Wiig (2004:65) also pointed out that people preferred to base their thinking, decisions and actions on ways that were easy, natural and convenient. Farmers thus tended to use ‘people’ sources who were easily accessible to them, suggesting the lack of information literacy on the side of the small-scale farmers.

This phenomenon could also be explained using Dervin’s Sense-making theory, which explains why people under invest in information and make sense of their situations based on their knowledge assets and on just a little that can be easily learned (Dervin 1983; 1999). Knowledge assets are dispositions to act, embedded in the minds of individuals or groups or artefacts of potential value (Boisot 1998:20). This finding underscored the need to encourage farmers to use quality or new information

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<sup>68</sup> Nine-seeded hole technology is farming system whereby a hole is dug two feet deep by two feet wide. The hole is filled with plant residue and top soil and nine maize seeds are planted in it at the corners and at the centre. The decomposing plant residues provide nutrients for the crop and moisture is conserved. Mulching with dry grass protects top soil and prevents water loss through evaporation. The nine-seeded hole technology improves soil fertility, conserves moisture and increases yields. Other than maize, other crops such as cow peas can be grown.

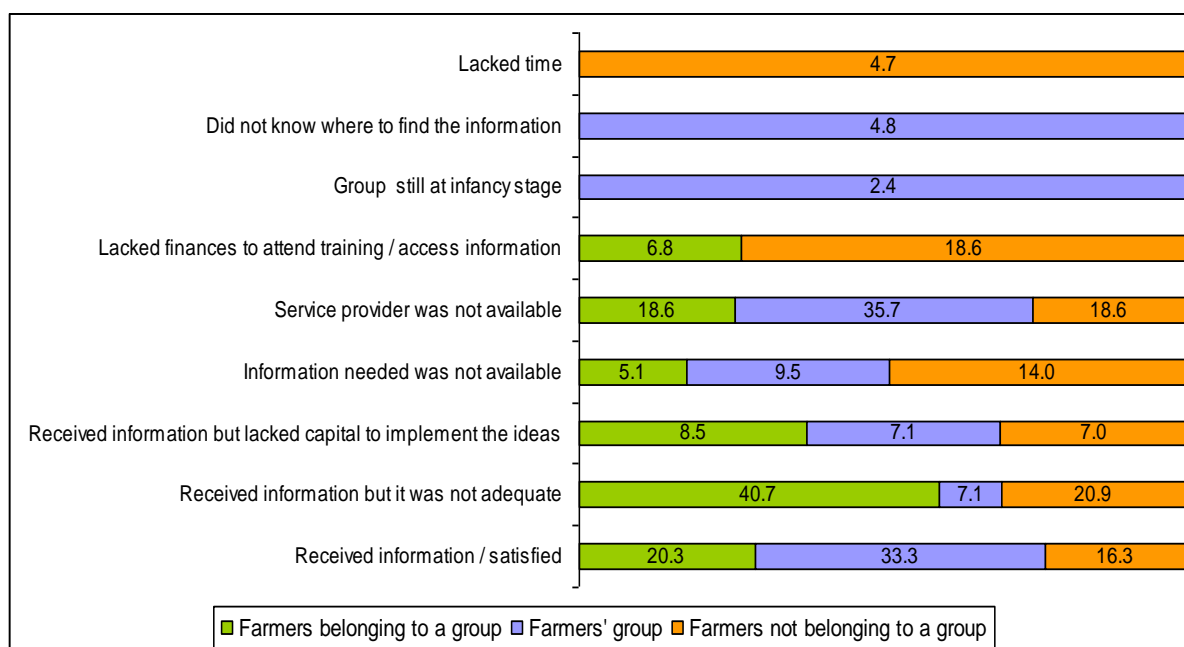
and knowledge that may require more effort or cost to obtain, in order to reap the benefits or value of information on “what they do not know” such as information on new technologies that may be higher yielding or pest and disease resistant varieties. These findings pointed to a need for further research on how to motivate people to seek and use information (Case 2002:119; Wilson 2006a:682).

The differences observed between the information seeking behaviour of farmers belonging to a group for the enterprise ranked priority number one and number two depicting higher percentages for the information seeking processes for the enterprise ranked priority number one than number two could be partially explained by Bandura’s Social cognitive theory (see **section 3.2.2.2**) that showed that farmers learned through the influence of others in the group and were motivated by other members of the group (Bandura 1977; Miwa 2005:54). Most farmers groups frequently engaged in the production of one enterprise. This suggests that farmers interacted and learned more from the group in connection with their first priority enterprise than for the enterprise ranked priority number two. The influence of the group on members through learning and observation thus motivated members and influenced their information seeking behaviour leading to the higher percentages obtained for the enterprise ranked priority number one (see **Figure 18** above).

The present study showed that information seeking behaviours depended to some extent on the enterprise produced, the location and gender. This finding was consistent with Garforth’s (2001a) who found different information seeking behaviour between two villages in Eritrea. The findings of the present study showed that there were gender differences in information seeking behaviours with more male than female farmers seeking information. Women did most of the work on the farm but did not often participate in technical discussions, which were dominated by male farmers (Nyankanga *et al.* 2004:143), suggesting the need for gender sensitive strategies that targetted female farmers. In the context of AKIS, the present study’s findings highlighted the importance of extension, the private sector actors as well as neighbours, relatives and friends as key sources from whom farmers sought information, and the role of groups in facilitating learning and sharing of information and knowledge. Furthermore, the findings point to the need for formulating gender differentiated strategies to improve access to information accessed by men, women and youth.

### **7.2.3 Efforts of farmers groups' and individual farmers in trying to obtain agricultural information, advice and training on technologies or farming methods**

Farmers’ groups and individual farmers had tried to obtain the information, advice and training mentioned above that they needed on a technology or farming method that they wanted to introduce or improve but did not have enough information about. **Figure 19** summarises the findings on the efforts made by the three categories of small-scale farmers.



**Figure 19: Efforts of small-scale farmers in trying to get information, advice or training on new technology or on production**

N=83 for farmers' groups, N=88 for farmers belonging to a group and N=43 for farmers not belonging to a group

### 7.2.3.1 Farmers' groups efforts in trying to obtain information, advice or training

Almost half (41, 49.4%) of the groups (N=83) had tried to get information, advice or training from various information sources while 42 (50.6%) had not tried. An analysis of groups that had tried to get this information by type of group showed that three quarters were mixed groups (31, 75.6%), followed by female only (8, 19.5%), male only and youth only (1, 2.4% each) groups.

Sixteen (16, 35.7%) for those who had tried to get information showed that the service providers were not available, while one third (14, 33.3%) had received information and were satisfied. Some groups had been trained by experts from development partners, extension services, civil society institutions, seed and agrochemical companies and horticultural exporting companies. Four groups (4, 9.5%) said that the information they needed was not available. Some had visited training and education institutions or had consulted other information providers but the training and information they received had not been adequate. Others received the information but lacked the capital base to implement the ideas or to buy inputs or farm implements. A few said they did not know where to find the information, while some said they did not have time to look for information (see **Figure 19**).

### **7.2.3.2 Efforts made by individual farmers in trying to obtain information, advice or training**

Fifty five (55, 62.5%) of the individual farmers belonging to a group (N=88) and 43.1% (25) farmers not belonging to a group (N=43) affirmed that they had tried to obtain information, advice or training. Responses from the 55 farmers belonging to a group that had made some effort to get information showed that 24 (40.7%) had received information but it was not adequate. Some farmers explained that the information flowed very slowly, while one farmer remarked that the information obtained was not reliable or appropriate. Some indicated that they obtained information on production and were producing new enterprises but lacked information on markets and prices. A fifth of the informants (12, 20.3%) had received information and was satisfied. Some farmers said they obtained loans through their groups, which had enabled them to buy essential farm inputs including seeds and fertilisers, which had resulted in higher yields. One farmer submitted: “I visited Embu show and learned about Edden F1 variety of tomato which is high yielding,” while another stated that “I started bee keeping on a small-scale basis and now I have two modern hives.” On the contrary, some said they could not find the service providers (11, 18.6%). Other experiences encountered by farmers belonging to a group in trying to get information are presented in **Figure 19**.

Of the 25 farmers not belonging to a group who had tried, 9 (20.9%) stated that they received some information but it was not adequate, while 8 each (18.6%) said that they did not know where to find the information. Others lacked financial resources to access the information (to attend training or seminars), while a few had received the information they needed and were satisfied (7, 16.3%) (see **Figure 19**). Some farmers observed that the training provided was too theoretical hence was not properly understood and was not implemented. **Appendix 44** presents examples of some narrations of efforts made by farmers not belonging to a group in obtaining information, advice or training.

### **7.2.3.3 A comparison of efforts of small-scale farmers in trying to get information**

A comparison of the results obtained from the three categories of informants (see **Figure 19**) revealed that there were more farmers belonging to a group than farmers not belonging to a group or farmers' groups who stated that the information they received was not adequate (40.7% versus 20.9% and 7.1% respectively). Farmers' groups appeared to be relatively more satisfied with information they obtained from providers than individual farmers belonging to a group and farmers not belonging to a group (33.3% versus 20.3% and 16.3%). There were slightly more individual farmers belonging to a group who lacked capital to implement their ideas than farmers not belonging to a group and farmers' groups (8.5% versus 7.1% and 7%) respectively. However, there were more groups than individual farmers who indicated that they could not find the appropriate information service providers (35.7% versus 18.6%).

The findings gave evidence of information seeking to improve agricultural production, with 49.4% farmers' groups, 62.5% individual farmers belonging to a group and 43.1% farmers not belonging to a group having made an effort to obtain agricultural information, advice and training. In comparison, Chilimo (2008:310) found that a much higher percentage (93%) of rural people in Tanzania, had made efforts to seek information. Findings of the present study showed that there were more farmers belonging to a group that had made efforts to get information than farmers not belonging to a group. This finding suggests that farmers belonging to a group were more likely to look for agricultural information because of their social networking systems, than farmers not belonging to a group.

The emerging themes of the outcomes for farmers who had tried to get the information they needed were i) the service providers were not available, ii) farmers received information and were satisfied, iii) some groups were trained by experts, iv) the information needed was not available, v) information received was not adequate, vi) farmers did not have the capital base to implement the ideas, vii) farmers did not know where to find the information and viii) farmers did not have time to look for information. It was noted that some of the informants who stated who they did not know where to find information and did not have time had their minds set on the old extension system and expected extension officers to visit them on their farms and provide advice and information. This finding on service providers not being readily available suggests the need for farmers to be proactive and demand services and information. The finding on farmers not having the resources to implement ideas from the information they accessed was similar to other authors (Berdegue and Escobar 2002:12; Matovelo, Msuya and De Smet 2006), who found that small-scale farmers had limited assets and production resources and thus could not afford inputs. This finding implies that there was a need to link farmers to sources of credit, to enable them improve their productivity. The finding on farmers not knowing where to find information indicates a lack of information literacy on the side of the farmers. The major themes of the outcomes for farmers who had tried to seek information point to existing gaps, barriers and constraints that information providers needed to take into consideration in improving access to agricultural information.

The finding on more farmers' groups than individual farmers not being able to find information service providers (35.7% versus 18.6%) could be explained by the pluralistic mode of extension service delivery which targeted groups as opposed to individual farmers. In other words, more farmers' groups than individual farmers were seeking information because extension services were delivered through groups, hence more groups were trying and not succeeding. As noted by many authors (Davis, K. E. 2006; Madukwe 2006; LEISA 2007:4), extension services were now being delivered through the group approach. This group strategy thus discouraged individual farmers who used to seek assistance from extensionists from looking for extensionists.



The finding of the present study on training being too theoretical suggests the need to complement theoretical training for farmers with practical sessions to ensure the information imparted was clearly understood. Findings by Rees *et al.* (2000:14) in Kenya and Bagnall-Oakeley *et al.* (2004:124) in Uganda confirmed that farmers preferred “learning by doing” through interactions with intermediaries, practical demonstrations and study tours. However, the present study showed that some farmers could not attend training because they lacked the financial resources to do so. As pointed out by Koblik and Aguiar (2008:166), most farmers were struggling due to their meagre financial resources, which affected development.

The efficiency of combining theory and practice was demonstrated by i) Adendorf’s training programme in South Africa (Meyer 2000:142-144), which provided theoretical training to farmers followed by practical training, where issues covered in theory were discussed and applied “in a real-life situation” and the training techniques combined lectures which used metaphors, storytelling, demonstrations, repetition, revision and field visits. As pointed out Wiig (2004:66,96,107,110), storytelling is a key approach to sharing information, knowledge, beliefs and traditions as well as operational information and methodological knowledge, and assists in learning by painting pictures that tie to the mental models of farmers. Stories are natural and describe and provide frameworks that are believed and internalised by the listeners, hence can help farmers to learn better. ii) The FFS approach which encouraged farmers’ experimentation and self discovery while adjusting to the local conditions and production constraints (Braun *et al.* 2007:18; Duveslog and Friis-Hansen 2008:240).

With regard to the information required not being available, Leckie’s (1996:316) study showed that female farmers in the USA addressed their unmet needs by forming an “invisible college” of peers, which facilitated the search for information or relied on their own experience and experimentation. It was observed that farmers in Kirinyaga had also established informal networks for exchanging and sharing information (see **section 9.1.11**). This finding pointed out the importance of local social networks and the need to encourage farmers to join informal networks in their localities. An area for further research would be to explore the role of informal social networks in the sharing and exchange of agricultural information and knowledge. As pointed out by Kiptot *et al.* (2006) in Western Kenya, informal social networks such as farmer-to-farmer dissemination played a key role in disseminating agricultural technologies, and that seed and knowledge were largely shared along kinship ties. The findings of the present study on farmers not knowing where to find information and not having time to look for information suggests a culture of not seeking information. This has serious implications for dissemination of technological information by the various actors working with small-scale farmers. Potential information providers therefore need to be alerted to this information behaviour and ‘push’ approaches may be necessary to complement existing information sharing strategies.



#### **7.2.3.4 Reasons for not making an effort to seek information, advice or training**

A significant number of farmers' groups (42, 50.6%), farmers belonging to a group (33, 37.5%) and farmers not belonging to a group (33, 56.9%) indicated that they had not taken any action to seek information, advice or training. The reasons cited by the groups for not seeking information included not knowing where to find the information, while some groups said that they were still at the infancy stage of development and had not started looking for information. The emerging themes from the reasons cited by individual farmers included i) they did not know where to look for the information or training, ii) they did not have time, iii) they did not have production resources, iv) there were no training opportunities and v) information providers were not available locally. The emerging themes were categorised under awareness factors such as not knowing where to find information, personal factors such as not having time, interpersonal factors such as the groups being at the infancy stage and not ready to seek information, economic factors such as not having production resources and environmental factors such as not having information providers in their geographical localities.

Some of the reasons cited by small-scale farmers in the present study for not taking action to seek information were similar to those identified by Chilimo (2008:310-311) in Tanzania, which included not knowing where to find information, fear of asking someone, the conviction that the information needed was not available, limited availability of information providers and intermediaries, failure to articulate needs, feeling of indifference and lack of motivation. Wilson's information seeking behaviour model (Case 2002:119; Wilson 2005; 2006a:682; Bawden 2006) (see **section 3.2.3.1**) supported findings on the factors identified by the present study. Wilson's general model of information behaviour thus helped explain some of the barriers that prevented farmers' groups and individual farmers from seeking information. According to Wilson (2005:33), there were personal, interpersonal as well as environmental barriers that made people not seek information. These findings emphasised the need to motivate farmers and farmers' groups to seek information. The high proportion of farmers who had not sought the information they needed shows that information literacy is a critical proficiency in seeking agricultural information and knowledge. This suggests the need for increasing information literacy of small-scale farmers and strengthening their ability to seek information. This finding further suggests the need for conducting regular needs assessments to articulate the needs of users, the need to develop appropriate content to meet the needs of the different farmer categories and the need to create awareness of sources of agricultural information.

### **7.3 Sharing of agricultural information and knowledge (external and local knowledge)**

While farmers accessed agricultural information and knowledge from various actors, they also shared the knowledge assets and information possessed by different individuals. **Sections 4.1.5 and 4.4** described two types of knowledge systems that were different and unique. Both external information and local knowledge are acknowledged as important resources in farming. This section presents

results on how farmers' groups and individual farmers shared agricultural information and knowledge, who they shared it with, how they shared and reasons for sharing.

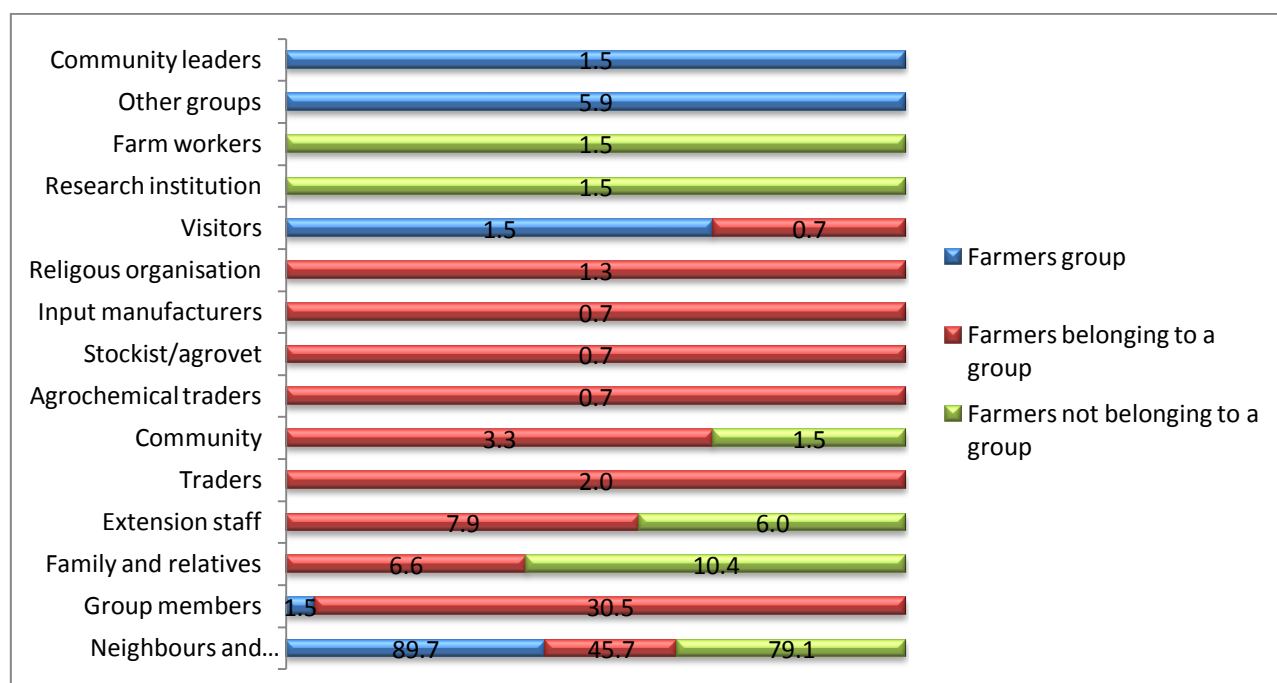
### **7.3.1 Who farmers shared agricultural information and knowledge with**

Farmers shared external agricultural information and knowledge and local knowledge with different members of the community.

#### **7.3.1.1 Who farmers shared external agricultural information and knowledge with**

Most farmers shared external agricultural information and knowledge on their agricultural practices (85 responses, 89.5% for farmers belonging to a group (N=95) and 60, 92.3% for farmers not belonging to a group (N=65)), while a few did not (10, 10.5% of farmers belonging to a group and 5, 7.7% of farmers not belonging to a group). Seventy one (71, 81.6%) groups indicated that they shared information they accessed with other members of the community while 16 groups (18.4%) did not (N=87). It was observed that there were more individual farmers belonging to a group (N=102) than farmers not belonging to a group (N=69) who shared information with other community members (92, 90.2% versus 59, 85.5%). The data suggests that there are more farmers' groups that did not share external agricultural information than individual farmers. The groups that did share, shared external information with different members of the community. Farmers' groups shared information with fewer individuals and institutions (5) than individual farmers. Farmers belonging to a group shared information with more stakeholders (11) than farmers not belonging to a group (6) (see **Figure 20**).

Sixty one (61, 89.7%) of the farmers' groups (N=68) shared external information and knowledge with other farmers, neighbours and friends in the community (those who asked), with other farmers' groups (4, 5.9%), leaders in the community, group members and visitors to the community (1, 1.5% each) (see **Figure 20**). Farmers belonging to a group (N=94) shared mainly with neighbours and other farmers (69, 45.7%), other group members (46, 30.5%), extension staff (12, 7.9%), and relatives and friends (10, 6.6%). Others included community leaders, traders, religious organisations, agrochemical representatives, stockists, input manufacturers, and visitors. A similar trend was observed for farmers not belonging to a group (see **Figure 20**). Comparatively, more farmers not belonging to a group (N=57, 67 responses) shared information that they accessed with neighbours than farmers belonging to a group (79.1% versus 45.7%) and with family and friends (10.4% versus 6.6%).



**Figure 20: Who farmers shared external information and knowledge they access with**

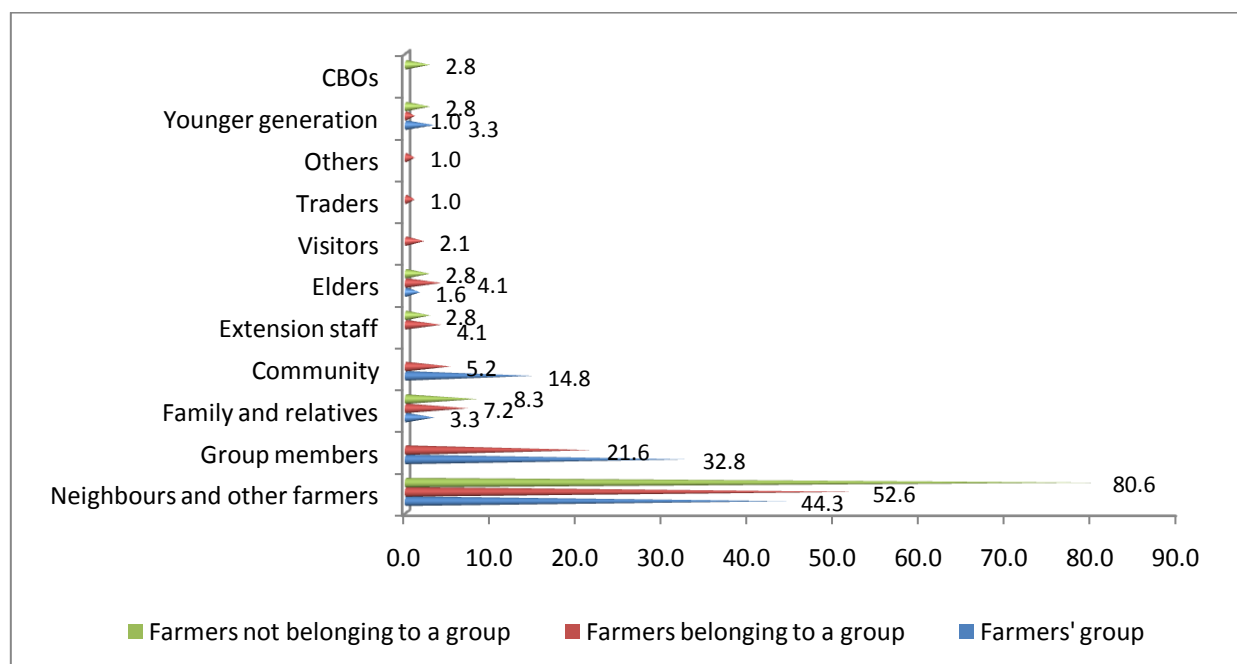
N=68 for farmers' groups, N=94 for farmers belonging to a group and N=57 for farmers not belonging to a group

The findings of the present study showed that most farmers shared external agricultural information and knowledge with other members of the community (86.6% of the groups, 89.5% of the farmers belonging to a group and 92.3% of the farmers not belonging to a group). Davis's (2004:131) study partially supported the present study's findings, and showed that all the dairy goat farming groups in Meru district, Kenya, shared external information with other members of the community. The limited number of information providers in Kirinyaga district made sharing of information among farmers critical. Information was shared for various reasons which are also supported by similar studies including to i) empower communities (Harris 2002), ii) ensure effective decision making (Cooper and Denning 2000; Harris 2002), iii) because it was essential for rural development (Garforth, Khatiwada and Campbell 2003:1) and iv) for improving livelihoods and economies (Pretty and Wesseler 2004:9). These findings suggest the need to motivate farmers to share information in the community to enhance rural development.

### 7.3.1.2 Who farmers shared local knowledge with

When asked whether they shared local knowledge assets that they possessed or not, 50 farmers' groups (58.1%) responded yes, while 36 (41.9%) answered no (N= 86 groups). Responding to the same question, 62 (61.4%) farmers belonging to a group answered yes and 39 (38.6%) answered no (N= 101), while 38 (53.5%) farmers not belonging to a group (N=71) answered yes and 33 (46.5%) no

respectively. Since the questions on who farmers shared the local knowledge were open ended, multiple responses were provided, which were not mutually exclusive (see **Figure 21**).



**Figure 21: Who farmers shared local knowledge they possess with**

N=45 for farmers' groups, N=62 for farmers belonging to a group and N=36 for farmers not belonging to a group

Farmers' groups (N=45) mainly shared local knowledge assets possessed by the group and individual members with neighbours and other farmers who asked (27, 44.3%), other group members (20, 32.8%), community members (9, 14.8%), younger members in the community, older people in the group, and relatives. Farmers belonging to a group (N=62) shared with neighbours (51 responses, 52.6%), group members (21, 21.6%), family members and relatives, extensionists, elders, other community members, visitors and the younger generation. There were more farmers not belonging to a group (N=36) who shared local knowledge they possessed with neighbours (29, 80.6%), than the other two categories of farmers. A few farmers not belonging to a group shared with family members and relatives (3, 8.3%), elders in the community, CBOs and the younger people in the community (1, 2.8% each) (see **Figure 21**).

The findings of the study showed that more than half the farmers' groups and individual farmers shared local agricultural information. The study findings supported Pickering (1996:450) who found that local knowledge was mainly shared with family, farmers' groups, group members and neighbours who shared similar customs, values and beliefs. Mundy and Compton (1991) also observed that knowledge was shared with the younger generation, while Bagnall-Oakeley *et al.*

(2004:121) in Uganda noted that farmers mainly shared local information with other farmers. Although Mgumia (2001:1) found that local knowledge was also shared with extensionists, researchers and project staff in rural areas, the findings of the present study, and other authors (Kristjanson *et al.* 2009:5051-5052) established that there were limited opportunities for farmers to share local knowledge with researchers. Kristjanson *et al.* (2009:5051-5052) observed that some actors perceived farmers to be receivers of knowledge, which led to mistrust and power asymmetries.

### **7.3.2 How farmers shared agricultural information and knowledge**

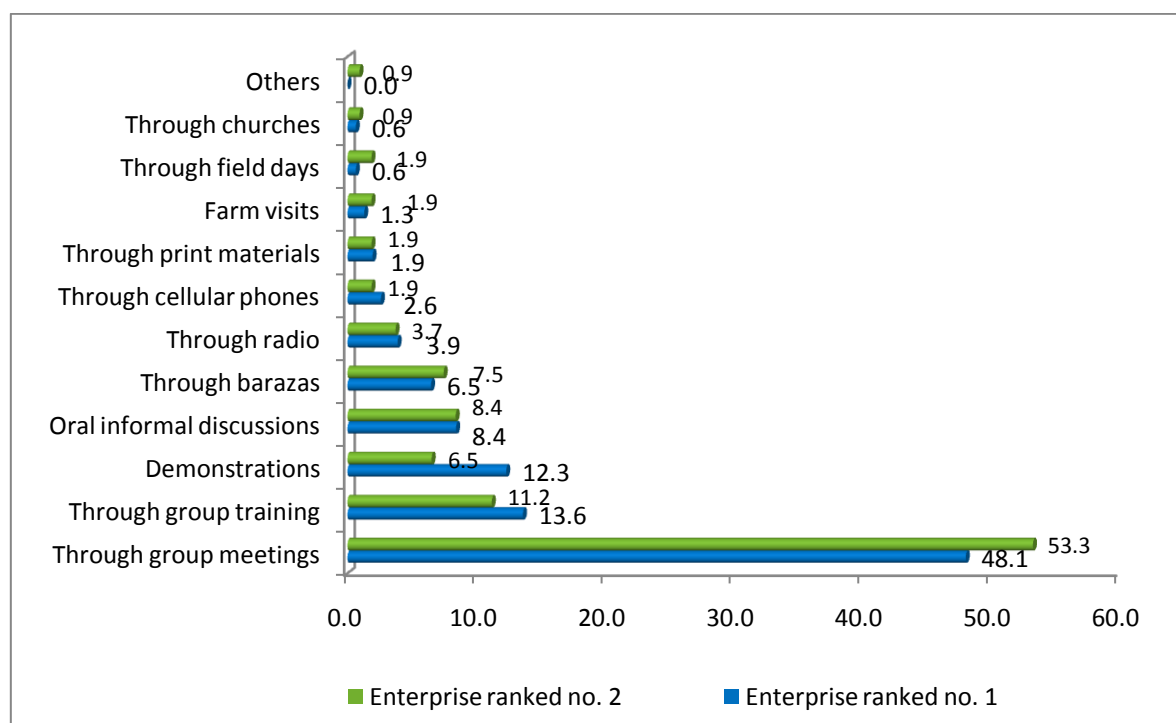
Farmers' groups and individual farmers (belonging and not belonging) shared external agricultural information and local knowledge they collected in various ways.

#### **7.3.2.1 External agricultural information and knowledge sharing by farmers' groups**

Farmers' groups shared external agricultural information and knowledge with other group members as well as with other community members.

##### **7.3.2.1.1 Sharing external information with other group members**

Farmers' groups shared information collected for the enterprise(s) ranked priority number one (N=84 groups, 154 responses) and priority number two (N=68) with members through: i) group meetings 74 responses (48.1%), and 57 (53.3%) for the enterprises ranked priority number one and number two respectively, ii) training 21 (13.6%) and 12 (11.2%), iii) demonstrations 19 (12.3%) and 7 (6.5%). Additional ways in which farmers' groups shared information for the enterprises ranked priority one and two are shown in **Figure 22**. There appeared to be no major differences between the way the groups shared external information for the enterprise ranked priority number one and number two.



**Figure 22: How farmers' groups shared information and knowledge for the enterprises ranked priority number one and two with group members**

N=84 for the enterprise ranked priority number one, N=68 for the enterprise ranked priority number two

#### 7.3.2.1.2 Sharing external information with other members of the community

Apart from sharing with group members, the groups shared the information and knowledge they accessed with other members of the community. Most of the information was shared orally through interpersonal means (42, 60.9%), while some was shared through demonstrations (8, 11.6%), visiting their fields or nursery (5, 7.2%) and by inviting them to attend their group training or by training them (3, 4.3%). A few shared information through exhibitions, farm visits, local leaders, other groups, printed materials and through religious gatherings. Individual farmers belonging and not belonging to a group shared external information orally through discussion, visiting each other, demonstrations, training, barazas, sharing print and plant materials, field visits, and announcements in church (see **Appendix 45**).

Information gathering is a time consuming exercise. Lamoral (2001:182) found that most forestry professionals at the Institute for Commercial Forestry Research spent 20 to 40 hours a month searching for information. As a result, most people preferred to use sources within their proximity. The findings of the present study showed that oral interpersonal communication was the preferred channel of most small-scale farmers. Most groups shared information orally through group meetings, which helped farmers to express their understandings, and misunderstandings, which were discussed

until the group came to a consensus. This finding was confirmed by many authors (Kiondo 1998; Meyer 2000:187; Leach 2001a:57; 2001b; Adomi *et al.* 2003:390; Stefano *et al.* 2005b:61). Oral communication is linked to Africa's oral tradition that is closely associated to culture, beliefs and social ties hence there is a strong likelihood of accepting external information shared through indigenous knowledge systems (Dissanayake 1992). For example, Meyer (2000:189) demonstrated that farmers' groups from the Phokoane community in South Africa were more receptive to external information that was shared orally through training based on their existing local knowledge base. Lamoral (2001:182) also found that almost one third of the forestry workers preferred information from "people" sources within their industry. For Hildreth, Wright and Kimble (1999), oral communication increased trust and inculcated a "sense of identity." The main reasons for the preference for oral interpersonal channels was to satisfy the oral tradition of most African cultures (Leach 2001a:57; 2001b; Meyer 2003a; Stefano *et al.* 2005b:59), because the network of contacts was easy to access and require little effort to obtain and the information obtained was relevant (Lamoral 2001:182-183). In addition, as pointed out by Cross and Baird (2000:71), people often sought information from colleagues they trusted rather than other sources and were "five times more likely to turn to friends or colleagues." Information shared with a group or group representatives was rapidly shared with other group members through meetings or training organised for groups.

Training was the second most important way through which farmers' groups shared information and knowledge on the production of the two top priority enterprises. Meyer's (2000:153-154) study on the transfer of agricultural information to rural communities established that group training was considered to be cost-effective and many farmers sharing common goals, problems and expectations learned from the external information shared through training. Group members supported each other and explained issues that some members forgot or did not understand during meetings or informal interactions. The processes of learning were explained by the CoPs theory (Wenger 1998; Wenger, McDermott and Snyder 2002; Davis 2005:104), which is rooted in phenomenology (see **section 3.1.2.1**). The groups provide the learning space for farmers in the group who share a common interest and learn through participation. The collective social learning was demonstrated in the practices of the group. As pointed out by Steyaert *et al.* (2007:540), social learning is about improving people's understanding. Groups provide platforms where group members established relationships *in situ*, shared information and knowledge and tried out new applications together. This finding confirmed the views by Röling and Jiggins (1998) on the importance of platforms for sharing ideas, problems, information and knowledge

Many authors (Stilwell 2001b; Chaka 2003:65; Morris and Stilwell 2003:72; Stefano *et al.* 2005b:59; Matovelo, Msuya and De Smet 2006:260-261; Morris 2007) have highlighted the role of print in providing agricultural information. However, the present study, like Kalusopa's (2005) found that



very few farmers shared agricultural information through print materials. As pointed out by other authors (Chaka 2003:65; Stefano *et al.* 2005b:60), the main reason for the low uptake of print materials was the non availability of print agricultural materials that farmers could access locally (Stefano 2004; Morris 2007:24), and lack of appropriate skills (Chaka 2003:65; Morris 2007:24). Besides, most print materials available did not meet the needs of small-scale farmers (Stefano 2004). Despite the many farmer targeted materials produced by the AIRC under the Ministry of Agriculture in Kenya, these publications were not visible at the grassroots level. This finding points to the need for decentralising the distribution of farmer materials produced by the AIRC to district level to improve their visibility and usage.

The finding of the present study on only a few farmers' groups using the cellular phone to share external agricultural information (see **Figure 22**) suggests that despite the low usage, there is potential for this powerful and pervasive tool to transform the lives of rural communities. Given its wide adoption for money transfer (M-Pesa) and personal communication, its usage for accessing and sharing agricultural information could be improved if farmers are trained on how to appropriately use the tool, and if the cost for accessing agricultural related information services using the cellular phone is subsidised. As detailed in **section 9.5**, cellular phones have been used by small-scale farmers to seek information from experts, to share information with farmers, and to access information from agricultural and market systems.

#### **7.3.2.2 How farmers shared local knowledge**

Farmers' groups (N=45) shared local knowledge possessed by group members through informal oral discussions (25 groups, 55.6%), meetings (8, 17.8%), demonstrations and farm visits (7, 15.6%), barazas (2 groups, 4.4%), prayer groups and parent to child (1, 2.2% each). **Appendix 46** presents some examples on how farmers shared local knowledge. Farmers' groups also shared knowledge with members of the group through group meetings, by looking through the group's minutes or record books, or notebooks of individual members. One group narrated how they had used their hand-written notes to train other people, or to explain to farmers who visited their farms. Results from farmers belonging to a group (N=10) showed that local agricultural knowledge was mainly shared by word of mouth and stories (9, 88.9%) and through print materials (one farmer belonging to a group, 11.1%). Findings from farmers not belonging to a group confirmed the results obtained from farmers belonging to a group and showed that information was shared by word of mouth (4, 100%).

The findings of the present study on sharing local knowledge, orally from elders and parents to the younger generation, through discussions, group meetings, stories, demonstrations, personal notes, minutes and print were consistent with other authors (IIRR 1996:3; Ngulube 2002; Pidatala and Khan 2003:4; Stefano *et al.* 2005b; Santilli 2006:1). The high percentage of farmers using oral



communication to exchange local knowledge implies that information managers need to exploit this channel and work with small-scale farmers to capture and document this knowledge for wider sharing (for example as established by the present study and Leach (1999:81,85), NGOs were among the few actors who played a key role in providing local knowledge to community members). This finding also demonstrates that it is important for small-scale farmers to belong to a group in order to share in the collective body of knowledge and exploit the knowledge and skills of colleagues. According to Cross and Baird (2000:70), people who did not have opportunities for collective learning from peers were likely to stagnate intellectually. Farmers' groups and social networking among small-scale farmers in Kirinyaga district were thus very useful in ensuring the effective flow of information. Knowledge flowed through members and was shared through the interactions of group members or their social networks. The remark by the farmer who stated "by sharing what we know with others, we also learn what they know" demonstrates the process of sharing knowledge, where knowledge shared was used and new knowledge was created. As noted by Styhre (2003:33-36), knowledge is "fluid and moving, embedded in social relationships, and emerges in practices and use of concepts."

According to Davenport and Prusak (2000:92), Sen (2005:375) and Waters-Bayer and Van Veldhuizen (2005:4), the method used for sharing or transferring knowledge was dictated by the culture of the community. Many authors (Mundy and Compton 1991; The World Bank 1998:8; Jain 2006:62; Nwokeabia 2006:1; Ibui 2007:261) confirmed that local knowledge was shared orally along social and cultural factors. As pointed out by Sturges and Neill (2004:53,208) "The oral tradition is particularly rich in agricultural knowledge," and "its content lives and breathes," and keeps changing. Some local knowledge in Africa was shared through cultural festivals organised by communities (Kaniki and Mphahlele 2002:6), exhibitions (GebreMichael 2006:1), and knowledge fairs (Karamagi Akiiki 2006:75).

**Section 4.7.3.2.1** outlined how barazas were used to share administrative and development information and knowledge with the community. Barazas are very important communication channels because they are associated with traditional power. After sharing the main message of the day, the chief or convener of the baraza, often invites other community leaders to share development information and such opportunities facilitate the sharing of local knowledge as well as external information with farmers. Agricultural officers or other information providers often took advantage of the opportunity to share agricultural information and knowledge with farmers. Information shared through the baraza spreads rapidly through local social networks to other members of the community that did not attend. As noted by Loimeier (2005:26-27), sharing knowledge or information through such public gatherings ensured the social inclusion of community members. Mgumia's (2001:2,4) study in Tanzania found that farmers' groups in Mgeta in Morogoro shared knowledge on local crop protection methods by training fellow farmers through farmer seminars by sharing what they had

learned through their groups with other farmers. The Mgeta farmers' groups also used posters that were displayed in public places such as markets, schools and bars and through posters, booklets and leaflets.

In India, knowledge on the use of groundnut shell manure<sup>69</sup> was shared with farmers in different areas through experimentation after verification by scientists. The aim of conducting the experiments and controls was to demonstrate the benefits of the manure (Maruthi and Srinivas 2006:3).

According to Pidatala and Khan (2003:4), most local knowledge in developing countries was shared through women who were perceived to be change agents and “purveyors of information and knowledge.” The knowledge held by women was often shared with their nuclear and extended families. While the present study did not observe much use of modern ICTs for sharing local knowledge, in Uganda, farmers in Busoga district were using oral traditional interpersonal means, radio, video, e-mail and chat rooms to share (Karamagi Akiiki 2008:16) (see **section 4.7.3.2**).

Although farmers shared local knowledge, Nwokeabia (2006:1,2) pointed out that there were information asymmetries in the sharing of local knowledge because there was no network for sharing, hence useful knowledge or innovations did not reach other groups that could benefit from the knowledge in the community. An area for further research would be to study the information asymmetries in the sharing of local knowledge. This finding points to a need for a policy on local knowledge sharing that takes into consideration IPR issues. In sum, Smith (2005) argued that although knowledge was mainly shared orally, there was no single right way of sharing because knowledge sharing activities were determined by how individual farmers and groups felt about the process and the network of people they socialised with.

### **7.3.3 The role of farmers' groups in facilitating the sharing and exchange of knowledge and information**

Findings from farmers belonging to a group (N=96) showed that farmers' groups played a key role in facilitating the exchange and sharing of agricultural knowledge and information needed for the enterprises ranked priority number one and number two. When asked whether the group had facilitated sharing, 60 informants (60.6%) answered yes while 39 (39.4%) answered no. Some of the informants who answered no argued that the group did not facilitate sharing beyond group members because the benefits of the group were a privilege for group members only and that other farmers who wanted information should invest by joining a group where they would contribute and gain from the knowledge and information assets of the group.

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<sup>69</sup> Groundnut shell manure is an indigenous soil improvement product, whereby groundnut shells were spread in the cow shed and soaked with cow dung dropping and urine and then it is applied to the soil (Maruthi and Srinivas 2006:3).

Informants who answered yes (N=68) explained that the intervention of the groups had helped them to:

- Access training organised by different actors (Ministries of Agriculture, livestock, forestry, the private sector, CSOs).
- Provide access to information service providers such as extensionists or other experts in horticultural exporting companies to advise them on modern farming methods, GLOBALGAP standards and new technologies.
- Hold group meetings to plan, make decisions, discuss group activities and share and exchange ideas, which have enhanced joint decision making.
- Consult each other informally. These interactions enabled farmers to learn from one another and to share and exchange ideas, information and knowledge. Members with good skills and knowledge shared what they knew with other members of the group orally.
- Visit each other and learn from each other through interactions and exchanging of experiences, as well as by observing what others are doing. It was observed that the visits did not only provide for learning and sharing of experiences, but helped to improve community relations and social interactions. One informant remarked, “seeing the progress of others brings positive competition among group members, which helps us to improve farming practices.”
- Provide opportunities to access funds (from the group funds or to act as collateral to micro-credit and financial institutions for members to access loans).
- Facilitate understanding and increase knowledge on farming.
- Attend field days, shows, open days and study tours.
- Access inputs or improved goat breeds or breeding stock at lower cost.
- Block exploitative intermediaries (middlemen) and improve access to access better markets and prices through economies of scale. One farmer observed that the group had helped them improve milk prices from Kenya Shillings (KSh.) 2-5 (0.03 – 0.07 USD) to KSh. 21 (0.28 USD) per litre.
- Help members to share print materials owned by the group or group members.
- Help farmers to gather information, lease land and farm jointly thus reducing production costs, and increasing yields. This had greatly reduced the cost of investment per individual.
- Motivate members by inculcating a spirit of positive competition among members.
- Provide support in socially related issues in line with the objectives of the group (see **section 6.3.1.3**).

However, a few groups stated that they did not obtain adequate knowledge to enable them to improve farming. One cited delays in implementation due to absenteeism at meetings and another mentioned lack of financial resources to implement group activities.

The study findings showed that farmers' groups played an important role in facilitating the sharing and exchange of agricultural information and knowledge. Farmers joined groups to share and improve access to information and knowledge from information providers, to inform decision making and to improve community relations. Confirming the results of the present study, Kilpatrick (1999) highlighted the important role of group training in bringing about learning. Interactions between group members created a support network, which was strengthened and guided by the shared objectives of the group, participation in group activities and rules of the group (Kilpatrick and Bell 1998). The present study showed that farmers' groups had helped farmers to access training from different actors, which had empowered farmers with knowledge and skills that they shared with other members of the community. Kilpatrick's (1999:71) study in Australia showed that farmers preferred to increase their skills and knowledge through training (action learning) that was short, relevant and flexible. According to Kilpatrick and Bell (1998), social capital lubricated the processes of learning, accessing information and knowledge and values, and trust between members developed gradually through interactions, exposure and being acquainted with each other. As pointed out by Kilpatrick and Bell (1998), the most important factor in facilitating learning and change is the support network created through knowing each other.

Other authors (Heemskerk and Wennink 2004:41-42) have shown that the collective action of farmers' groups facilitated participation by individual farmers in economic activities such as in farmer associations, provided forums for meeting, sharing and discussing common problems and solutions, provided access to agricultural services and reduced costs through economies of scale. In addition, Madukwe (2006) noted that farmers' groups in most developing countries provided linkages to other actors, which provided access to more information and knowledge, while Gotschi, Njuki and Delve (2009:275) found that the social capital in groups in Mozambique increased the propensity to find assistance where needed, and access to information, though men gained more than women from the benefits of social capital.

To explain the role of groups in facilitating sharing of information and the manner in which groups operated, Pretty (2003b:1913) identified three types of social capital namely i) bonding between group members, ii) bridging between groups and community members (networking) and iii) linking. For Pretty (2003b), social capital yielded by farmers' groups could be explained by the bonding, bridging and linkages between group members that acted as a catalyst that facilitated the sharing and exchange of agricultural information and knowledge within groups, and trust between members. Trust was facilitated by cooperation (Pretty 2008:180), and collaboration between group members increased learning and the success of groups (Senge 2006:218).

The findings of the present study and other authors have provided evidence that working with farmers' groups i) improved access to services such as extension, marketing, finances, payments and collective bargaining (Stringfellow *et al.* 1997), ii) was cost-effective in reaching many farmers (Kimenye 1998:206), iii) facilitated strong collaboration between researchers, extensionists and farmers (Mulaa *et al.* 1999:27), iv) increased farmers' participation in decision making (Rees *et al.* 1999a:6), and v) provided better access to extension and advisory services (Mutua-Kombo 2001). Groups also helped to address the barrier of information asymmetry to some extent, in the sense that farmers learned together, shared information and worked together. For example, in cases where there was insufficient information on the quality of export produce, groups integrated vertically with processors or export markets to circumvent information asymmetries (Hennessy 1996:1037). This phenomenon was observed in Kirinyaga district, where farmers' groups integrated vertically with horticultural exporting companies and export markets for better coordination and access to information on good agricultural practices, which enabled them to earn premium prices. Through groups, farmers applied the GLOBALGAP standards, and sorted and graded their produce as a group at the marketing shed before marketing the produce. This finding demonstrates the important role played by farmers' groups in improving access to information and knowledge in an AKIS.

Group members motivated each other and influenced the level of adoption of new technologies. A study conducted by Marsh and Coleman (1956:590) showed that farmers in a group motivated and influenced each other and improved the level of adoption. According to these authors, the level of adoption of a farming innovation depended on the location or neighbourhood and their norms, which differed. This finding suggests that the adoption of new technologies or farming system in groups was not uniform as it was influenced by the internal environment within the group and the external environment where the group was located.

The present study showed that small-scale farmers in Kirinyaga district had established networks for accessing and sharing agricultural information on the enterprises they produced through the formation of farmers' groups. Elsewhere in Kenya, groups such as the LLL (Braun *et al.* (2007:19) and the FFS (Braun *et al.* 2007:19; Lightfoot and Scheuermeier 2007) had established networks that facilitated learning by farmers' groups through sharing of practical experiences pertaining to new improved technologies. As observed by Smith (2003), learning and sharing in groups called for committed participation in the CoPs (Wenger 1998; Coakes and Clarke 2006) (see **section 3.2.1.3**), and was a special type of social practice that facilitated farmers to acquire and share knowledge and skills by stimulating peer to peer exchanges over the internet. However, while CoPs facilitated deep sharing between group members, and glued together the members sharing common goals and objectives, they limited sharing outside the group. Although not highlighted by the study findings, there were some FFSs in Kirinyaga district. The FFSs were another example of how groups

facilitated the sharing and exchange of agricultural information and knowledge. The approach provided training (theory and practice) with the help of facilitators in an environment where farmers shared their problems and goals, interacted and learned together through experimentation and discovery. The findings on practical learning tested the Social cognitive theory, which explained how individual farmers and farmers' groups interacted through participation in training activities, their personal competencies and how the interactions affected their thoughts and behaviour, their interaction with other actors and farmers through observational learning and their personal factors and environmental determinants (Bandura 1977; Miwa 2005:54,56) (see **section 3.2.2.2**).

The present study showed that it was important for farmers to share information and learn from each other. Similar findings were established by Bachmann (2000:106). As observed by Pike (2008), individuals were the drivers of change, and the manner in which they influenced others was complex and diverse, and was tied to beliefs, norms, roles, social factors and networks. FFSs used their own knowledge and knowledge from group training (Williamson *et al.* 2003:191,193), and shared what they learned or what they observed others do with other members of the community through demonstration and through oral discussions. As farmers learned, their goals shifted and so did their information seeking processes. These findings demonstrate the importance of groups in sharing and exchanging agricultural information and knowledge and suggest the need to support group formation and strengthen existing groups.

#### **7.3.4 Reasons for sharing or not sharing agricultural information and knowledge**

**Section 7.3.2** showed that some farmers' groups and individual farmers shared information while others did not. This section presents and interprets findings on why farmers shared or did not share information and knowledge.

##### **7.3.4.1 Reasons for sharing external agricultural information and knowledge**

Farmers' groups (N=67), farmers belonging to a group (N=87, 94 responses) and farmers not belonging to a group (N=57, 71 responses) cited various reasons for sharing agricultural information and knowledge with other members of the community. The main reason cited by the three categories of users was to empower one another so that other community members could benefit from applying the information, improve understanding of farming activities and their farming practices (57, 85.1% for farmers' groups, 90, 95.7% for farmers belonging to a group and 40, 80.1% for farmers not belonging to a group).

Others shared in order to find better markets and prices through improved bargaining power and economies of scale. For example, it was observed that the sweet potato groups shared information with others to attract other groups to adopt the enterprise so that they would meet the set export



quota. Others cited reasons such as to create awareness so they could attract new members to join the group and contribute towards conserving the environment, learn about new technologies and understand farming practices from others. Individual farmers also shared because they perceived information to be vital to the success of farmers and to prevent the spread of pests and diseases (see **Appendix 47**).

#### **7.3.4.2 Reasons for sharing local agricultural knowledge**

Farmers' groups and individual farmers shared local knowledge to help others to improve their farming practices, to help improve understanding, to solve agricultural problems, to learn and to experiment and compare between local knowledge methods and external information methods. As one farmer remarked, "by sharing what we know with others, we also learn what they know." Other reasons included to improve efficacy and reduce cost. Farmers perceived the application of external agricultural knowledge to be more expensive than local methods, which they considered affordable and more economical. For example, one group explained that farmers used local methods as a stopgap measure to minimise pests and control diseases and used *Aloe vera* and "Mweri" (*Prunus Africana*) for diseases and wood ash for pest control before seeking external help. Additional reasons were to conserve the environment, to meet market requirements for producing organic products and to preserve local knowledge for future generations. **Appendix 48** presents some narrations of reasons why farmers' groups shared local knowledge. **Section 11.2.3** highlights additional reasons for sharing.

The reasons captured above by the present study for sharing agricultural information and knowledge were similar to those established by earlier authors (Mundy and Compton 1991; IIRR 1996:3; Kaniki and Mphahlele 2002:2; Meyer's (2000; 2005; Nwokeabia 2006:1). According to Meyer (2000; 2005), the key reason farmers shared agricultural information and knowledge was to enhance rural community development. The findings of the present study showed that small-scale farmers shared local knowledge to improve understanding, to solve problems, to learn and to experiment. These findings were similar to those of other authors who found that farmers shared local knowledge to i) solve local problems (Warren 1991), ii) because it constituted part of their culture, which was preserved through sharing (Mundy and Compton 1991), iii) to guide innovation and understanding (IIRR 1996:3; Ngulube 2002; Maruthi and Srinivas 2006:3), iv) because knowledge gained more value when it was shared (Skyrme 1999), v) for their own development (Emery 2000:23), vi) to facilitate decision making on matters pertaining to local practices in agriculture, NRM and health (Emery 2000:23; Millar 2004), vii) to conserve and multiply indigenous plants (Mgumia 2001:4), viii) to solve emerging agricultural and environmental problems (Kaniki and Mphahlele 2002:2), ix) to avoid marginalisation (Kothari 2002:226; Ocholla 2007:237) x) to share ideas and inspire others (Waters-Bayer and Van Veldhuizen 2005:2), xi) to support community development (Mchombu

2004:11), xii) to experiment with information obtained (Waters-Bayer and Van Veldhuizen 2005:2; Nwokeabia 2006:1).

#### **7.3.4.3 Reasons for not sharing external agricultural information and local knowledge**

Results presented in **section 7.3.1.1** on sharing external agricultural information showed that some groups and individual farmers (18.4% farmers' groups, 10.5% farmers belonging to a group and 7.7% farmers not belonging to a group) did not share external information with other members of the community. The main reasons cited by group members for not sharing included that some members perceived the knowledge and information assets of the group to be private goods belonging to group members, and that other community members who wanted to access the information were to either join a group or form their groups, through which they would access information and knowledge. Others said no one had asked them to share, while some did not share because they did not want competitors in the enterprises they were producing.

Data collected from farmers' groups showed that a relatively high number (36 (41.9%) of groups did not share local agricultural knowledge (see **section 11.2.2**). The reasons for not sharing included i) lack of interest in local knowledge, ii) others considered local knowledge to be rooted in superstitions, iii) some argued that it was not compatible with modern ways of farming, iv) while others said it was outdated. v) A few informants argued that they did not share because they were satisfied with external information on modern farming, vi) because indigenous methods produced low yields, or in some cases, vii) the indigenous methods tried did not work. viii) Some said they did not share because they did not have a reliable source from which to learn or clear procedures on what to use and how to use them, ix) others feared sharing because people generally looked down on local knowledge, x) some were jealous and xi) limited time to share knowledge with other people.

The findings on more farmers' groups than individual farmers not sharing external agricultural information than farmers belonging to a group were surprising, given the infrastructure and network provided by groups for sharing. Among the category of individual farmers, more farmers belonging to a group than not belonging to a group did not share information. This finding went against the commonly held belief that groups increased the sharing and exchange of agricultural information and knowledge. Although the culture of not sharing information and knowledge led to information asymmetries, the flip side was beneficial to farmers' groups in tapping the value of information to increase and improve production, guarding their markets and others wanted a monopoly over the information to give them a competitive edge (Evgeniou and Cartwright 2005:297).

The main reasons identified by the present study for not sharing local knowledge were the perception that the knowledge assets of the group were a private good belonging to group members, the desire to



maintain a competitive edge over competitors, the indifference attitude and the low importance attached to the value of local knowledge. In addition to the reasons cited above in this section, Garforth *et al.* (2003:3) found information asymmetries because some farmers did not share information and knowledge with other community members for fear of competition in the market. Linked to the culture of not sharing, Pidatala and Khan (2003:1-3) observed that there were gender dimensions in the sharing of local knowledge based on gender roles which affected the way in which information was shared hence some of the knowledge and skills were held by local women and were not shared with men. For example women in India were responsible for feeding and milking cows hence held much local knowledge on cattle, which was passed on to other women but was not shared with men. Similar trends were observed in post-harvest operations. Nwokeabia (2006:2) found that some rural communities did not share local knowledge because they did not have a mechanism for sharing and were not certain what others were doing hence adopted an attitude of indifference. Nwokeabia (2006:2) described this attitude as the “indifference trap” and noted that some farmers considered sharing of knowledge to be useless.

#### **7.4 Integration of external and local knowledge**

This section presents and interprets findings on how and why farmers integrated or mixed the two types of knowledge, the relation between external and local knowledge and how the integrated information helped farming activities. Also covered in this section are the findings on the feelings and emotions of farmers about mixing and constraints and barriers encountered in mixing.

When asked whether they combined external agricultural information and knowledge and local knowledge in their farming activities, 36 (43.4%) groups (N=83) answered yes, while 47 (56.6%) answered no. Among the individual farmers, 45 (45.5%) of the farmers belonging (N=99) and 35 (50%) farmers not belonging to a group (N=70) replied yes, while 54 informants (54.5%) and 35 (50%) respectively answered no.

##### **7.4.1 Examples of how farmers combined external information and local knowledge**

**Section 4.4.3** outlined why external and local knowledge were useful for addressing farming problems. In combining the two knowledge systems and experimenting, some farmers indicated that they had come up with their own discoveries and innovations. Individual farmers cited various examples on how they merged the two types of knowledge in addressing pest and disease problems, soil fertility, crop husbandry and farm implements. For example, one farmer stated, “A certain mite affected my horticultural crop (melon) and it did not respond to the agrochemical that was prescribed. I used tobacco and it eliminated the problem.” Another said, “I combine local and external knowledge in treating my cows. When I have no money, I use locally available herbs, and when funds are available, I call the veterinary doctor” and “I grafted a local passion fruit variety with

improved varieties to improve quality and reduce pest and disease.” **Box 1** presents other examples of how farmers’ groups integrated external and local knowledge they possessed.

#### Box 1: Integration of external and local agricultural knowledge by farmers’ groups

##### **Compost and manure making**

“We used information on the Effective Microorganism (EM)<sup>70</sup> technology and combined it with our local knowledge on making compost and the result was improved soil fertility. The EM helped to break down the manure slowly hence the soil remained fertile for a much longer period.”

##### **Improved farming**

“We grafted mangoes using the local mango varieties as the rootstock and the exotic variety as the scion to obtain higher yielding disease resistant mangoes.”

“We fed our dairy cows with indigenous fodder shrubs and supplemented the feeds with dairy meal to increase milk yields.”

“We mixed modern bee hives and traditional hives carved out of trees to produce honey for different markets.”

##### **Pest and disease control and management**

“We used soil to control maize stalk borers (push - pull method) and at the same time used inorganic fertilisers.”

“We used medicinal herbs and synthetic chemicals to control red spider mites in tomatoes.”

“We used Mexican marigold (*Tagetes minuta*) to treat diarrhoea in rabbits as first aid measure while waiting for the expert to come.”

“We used traditional herbal preparations made from “Kiruma” *Aloe vera* to treat Newcastle disease in chickens and bought conventional agrochemicals if symptoms persisted.”

Some members used indigenous knowledge on local plants “Kahurura” (*Rynchosia minima*) for treating goats when the symptoms were mild, but called the veterinary officer if the condition did not improve.

### **7.4.2 Reasons for combining external information and local knowledge**

When asked why they combined external agricultural information and local knowledge, farmers’ groups (N=36) indicated that they mixed the two knowledge systems to reduce production costs (16, 44.4%), improve production and yields (6, 16.7%), because both types of knowledge were effective (4, 11.1%), to experiment (3, 8.3%), to test their efficacy and establish which option worked best, while two informants said it was because the materials used were locally available (2, 5.6%).

The emerging themes from the reasons cited by the two categories of individual farmers for merging external information and local knowledge were to increase production and improve farming, to reduce costs, learning and discovery, efficiency and effectiveness, managing risk and environmental conservation and sustainability (see **Appendix 49**). Results showed that farmers belonging to a group (N=36) and farmers not belonging to a group (N=18) mixed the two types of knowledge to improve production (16 responses, 42.1% farmers belonging and 10, 55.6% for farmers not belonging to a group) and because the knowledge systems complemented each other (3, 7.9% for farmers belonging to a group and 3, 16.7% for farmers not belonging to a group). One informant remarked,

<sup>70</sup> The “Effective Micro organism (EM)” technology is a manure management method used to make manure that facilitates the microbial composting in a controlled way. The method is effective in cleaning the soil of impurities and reducing odours of ammonia.

“External knowledge is more profitable but local knowledge is more sustainable and secure hence the need to mix.” A few farmers perceived that mixing reduced the cost of production (2, 5.3%) and improved human health by reducing chemical usage.

A few informants considered external information to be more reliable and superior to local knowledge (5, 13.2% farmer belonging to a group and 1, 5.6% for farmers not belonging to a group). One informant argued that external knowledge corrected the errors of local knowledge and another that at times it was more expensive to combine (2.6% each for farmers belonging to a group). One farmer not belonging to a group said he was still experimenting to find out which was a better option. However, some informants were strongly opposed to the idea of merging the two types of knowledge. Some perceived that the two knowledge systems did not relate (8, 21.1% farmers belonging to a group and 3, 16.7% farmers not belonging to a group). One informant from both categories of farmers preferred external information and did not combine the two types.

#### **7.4.3 Relation between external information and the group’s local knowledge assets**

Farmers’ groups were asked how the external knowledge related to the group’s local knowledge assets. Only 19 groups responded to this question. Some groups (7, 36.9%) indicated that both types of knowledge worked well with the group’s enterprises because some group members had knowledge and skills with both types of knowledge. Farmers often started with local knowledge because the materials were locally available then moved on to external knowledge. Others (3, 25.8%) perceived that the external information complemented the local knowledge assets that some group members had. Some groups remarked that mixing and applying external and local knowledge that members possessed increased yields, helped to manage risks and conserve the environment (2, 10.5%) each. One group stated, “Mixing reduced chemical usage and helped us to meet the market requirements” (1, 5.3%). Another group pointed out “Farmers get very little external information and so we use what is locally available.” However, one group was of the opinion that there was no relationship between the two types of knowledge and said they only applied external information (1, 5.3%).

#### **7.4.4 How integrated information facilitated the farming activities of group members**

Farmers’ groups (N=25) indicated that the integration of external information and local knowledge had helped to i) reduce production costs (9, 36%), ii) increase production, yields and profits (6, 24%), iii) control and manage pests and diseases (4, 16%), iv) ensure food self sufficiency (2, 8%), v) adopt diverse enterprises and farming methods (1, 4%), vi) manage risk (1, 4%), vii) some group members adopted diverse enterprises to spread risks and ensure there was enough income and food for the household. To ensure a steady provision of food, farmers practiced traditional farming which was sustainable, and modern farming which they perceived to be more risky. viii) Conserve soil and the environment (1, 4%). ix) One group stated that mixing the two types of knowledge had improved soil

structure and fertility and the environment. x) Another group argued that integrating the external and local knowledge systems attracted farmers from diverse backgrounds to join the groups (1, 4%).

The present study's findings on the mixing of external and local knowledge by small-scale farmers demonstrate the value of both knowledge systems in farming. Farmers commixed external and local knowledge as a way of increasing production, conserving the environment and ensuring sustainability. Farmers also mixed the two knowledge systems as a risk management strategy. In other words, if the outcome of the application of one knowledge system failed, the alternative would work. Others combined external and local knowledge and as a way of maximising the use of information and knowledge that was locally available. Scoones and Thompson (1994:18) believed that the local knowledge paid greater dividends to the needs and capacities of rural communities than external information. For Kaniki and Mphahlele (2002:2), scientific and local knowledge are considered equally important for human development at the local and global levels. Integrating external and local knowledge systems led to increased understanding of the views of the local people and improved communication between local communities and outsiders (Rajasekaran, Martin and Warren 1993). The finding of the present study that mixing the two knowledge systems attracted farmers from diverse backgrounds to join groups showed that linking new knowledge to what people knew helped them to open up and identify with what was being shared. This finding supported Rajasekaran, Martin and Warren (1993), who found that mixing the two types of knowledge led to increased participation by farmers and farmers' organisations in development and sharing of local knowledge and information.

Garforth's (2001c) study of AKIS in Eritrea showed that the problems of farmers could not be solved without new knowledge and information. This finding was consistent with those of Adedipe, Okuneye and Ayinde (2004) in Nigeria, which demonstrated that although the use of farmers' local knowledge has reduced the negative impacts of agriculture on the environment, small-scale farmers had gained higher yields by using small amounts of pesticides. Adedipe, Okuneye and Ayinde (2004) posited that there should be a balance of interplay between local knowledge and modern or scientific knowledge. While local knowledge provided the ideas and momentum for changes in agriculture and other areas, external information resulted in fresh ideas, awareness of new opportunities that leads to paradigm shifts and new practices (Garforth, Khatiwada and Campbell 2003). Besides, as noted by Röling (2004:7), knowledge in an AKIS is not only technical but also local innovation. Lewis (2008:300-301) found that households in Brazil were using local and external knowledge to guide them in land management decisions and as a safety net for minimising risks. In addition, Lwoga and Ngulube (2008) pointed out that mixing the two knowledge systems adds value to local knowledge.

The finding of the present study on the mixing of external and local knowledge as a risk management strategy was supported by other authors (Eklund 2009:13). For example, drawing from the agroforestry land use system, which is an old practice, Eklund (2009:13) showed that the traditional multistrata Chagga home gardens ensured food security among small-scale farmers in Babati, Tanzania and when some crops failed, income from timber and tree seedlings provided income. The present study and other authors (Hemp 2005:204; Eklund 2009:17) found that farmers merged external and local knowledge to conserve the environment and conserve biodiversity. Hemp (2005:204) found that the Chagga home gardens were an important habitat for flora and fauna. Farmers had introduced plant species into their *shambas* and more than 70% of the *Salsatoria* species (insect species) identified in the Chagga home gardens in Tanzania were forest species and more than 50% were indigenous species.

Aikenhead (2001:350) observed that a cross-cultural approach where the aboriginal knowledge and language were respected and acknowledged in a primary school science classroom helped the aboriginal students to see the world in two perspectives – from the western science world and from the aboriginal community worldview. At the same time, the teachers and other students learned from the perspective of how the aboriginal students viewed their world and emphasised the need for flexibility and integration of the two cultures. This example served to illustrate the effect of cross-cultural relationships in changing the social power where knowledge flowed from two cultures that were equally important. Although this example stems from education, the findings are relevant to the scenario of small-scale agriculture. The present study findings confirmed the views of many authors who shared Aikenhead's school of thought of cross-cultures (IIRR 1996:3; Röling and Pretty 1997; Meyer 2000; 2003b; 2005; 2009; Nathan, Lund and Theilade 2007:4). They emphasised the need for merging external and local knowledge and adapting them according to the farmers' own culture and environments (Mundy and Compton 1995:122; Madukwe 2006; Meyer 2009). For example, Kristjanson *et al.* (2009:5048) noted that farmers were very knowledgeable in rangeland management and indigenous livestock health and breeding and scientists stood to learn from farmers.

As an example, Meyer's (2000:190; 2005; 2009) study showed that small-scale farmers in Phokoane, South Africa relied on their local knowledge and were ignorant of external knowledge. External knowledge was thus introduced to them through "technology push" and by creating awareness of the value of the improved maize technology and how its potential in complementing their own local knowledge. The FFSs approach also took cognisance of the farmers' (local) expert knowledge and external knowledge (Braun, Thiele and Fernández 2000; Onduru *et al.* 2002; Rangi *et al.* 2002:6-7). For example, Saha *et al.* (2006:7) found that 16.7% of the FFS farmers in Kilifi district, Kenya were combining organic and inorganic nutrients based on their own local knowledge and what they had learned in FFSs. Maponya and Ngulube (2007:81-82) showed that the Tyolomnqa estuarine

community in South Africa were combining scientific and farmers' local knowledge to improve information and knowledge sharing, learning, and for effective and sustainable management of the estuary. Farmers in Central province in Kenya combined external information on soil management and local knowledge on soil quality based on soil characteristics such as what they could see, the feel and smell of soil, and on crops produced under different soil conditions to maintain soil fertility (Mairura *et al.* 2008:85). In Tanzania, subsistence farmers were combining external information on synthetic pesticides and local knowledge on storage pests around (Mihale *et al.* 2009:253).

The finding on the mixing of external information and local knowledge increasing yields and reducing costs suggest that the two knowledge systems were synergic and in addressing sustainability, there was a need to combine the two. As already discussed above, Eklund (2009:16-17) showed that agroforestry was a low cost technology which require minimum investment or external inputs such as pesticides as farmers mainly used locally available options. Other benefits of integrating included increased understanding of the views of the local people, increased participation by farmers and farmers' organisations in their own development, sharing of their knowledge and information, and improved communication between local communities and outsiders (Rajasekaran, Martin and Warren 1993). To Emery (2000:21), integrating the two knowledge systems led to improved linkages between actors and improved sustainability, while Breidlid (2009:147) emphasised that mixing promoted acceptability and sustainability of both systems. In Tanzania Mihale *et al.* (2009:253) established that the merger of modern scientific knowledge and local knowledge helped to reduce production costs.

With regard to how integrated information facilitated farming activities, the study findings showed that production costs had come down, yields and profits had increased, pests and diseases were controlled and managed, farmers had adopted diverse farming methods and enterprises to manage risks. To this end, Röling and Pretty (1997) suggested a need for an approach that factored the value of local agricultural knowledge into farming activities. Van Kerkhoff and Lebel (2006:460) also supported the idea of integration and recommended the development of new models that factored in the two types of knowledge systems.

Empirical evidence on the relationship between external information and local knowledge based on studies by Garforth (2001c) in Eritrea and Adedipe, Okuneye and Ayinde (2004) in Nigeria showed that small-scale farmers gained higher yields by applying external scientific information. The challenge for most farmers in the present study and identified by other authors (Failing, Gregory and Harstone 2007:48) was how to integrate the two knowledge systems. Hoffmann, Probst and Christinck (2007:361) stressed that researchers needed to learn from the strategies that farmers use in dealing with complexity, and broaden their research approaches by understanding the importance of



triangulated epistemologies and tacit knowledge of farmers. The study findings underscored the need for recognising the two types of knowledge as “capital” and hence the need to integrate external information and local knowledge systems based on the culture and own knowledge of farmers, their social backgrounds and environmental conditions. In the context of AKIS, the findings of the present study suggest the need to expose farmers to both external and local knowledge systems.

#### **7.4.5 Feelings or emotional responses of farmers to mixing external agricultural information with local knowledge**

The Sense-making theory (Dervin 1998; 2005; Naumer, Fisher and Dervin 2008) (see **section 3.2.2.1**) helped to explain the emotions and feelings of farmers in relation to mixing external agricultural information with local knowledge. According to this theory, farmers should be free to characterise what informs them using their own expressions and feelings and emotions because these expressions help in determining the outcomes of mixing and sharing information and knowledge with others over time and space.

The study findings showed that some farmers belonging to a group (N=32) and not belonging to a group (N=22) felt happy, motivated and eager to see results. Some said that they were comfortable about mixing and considered mixing useful. Others felt motivated to mix because they obtained better yields which they could sustain, while some said the cost of production came down and they conserved local knowledge.

On the other hand, others said that they were not happy about mixing and preferred to use external information because they perceived that it improved yields. Some felt confused and uncertain about the outcome because they were not sure of how to mix. Others explained that they applied local knowledge as a first step which sometimes worked while at other times it did not work. A few said they used local knowledge when they did not have money to implement the recommended scientific methods. Others said they started with indigenous methods but resorted to scientific methods if the problem persisted.

Some farmers felt that the two types of knowledge were not compatible or should not be mixed. For example, one farmer stated, “I used *Aloe vera* to treat Newcastle disease in chicken and it worked so there was no need for mixing.” A few perceived that local knowledge was easier to use than external information and argued that mixing lowered production. Some regarded the application of external information to be very expensive. For example, one informant explained: “I adopted grade cows to improve productivity when AI was relatively affordable but the cost now ranges between KSh. 500 (6.67 USD) and KSh. 1500 (50 USD) or more depending on the breed. At times, the cow may not conceive after insemination and more money is needed when the heat period returns after 21 days.

Such experiences make farmers resort to cheaper traditional ways of serving the cow using a local bull.” **Appendix 50** presents narrations of feelings and emotions about mixing external information and local knowledge.

#### **7.4.6 Barriers and constraints encountered in mixing external agricultural information with local knowledge**

The main barriers and constraints encountered by farmers in mixing external agricultural information with local knowledge included: i) finding sources of knowledge on local methods because those who had the knowledge were scarce and only a few were willing to train other farmers. ii) Some indigenous methods and scientific methods did not work. iii) There was very little or no information available on how to mix the two types of knowledge. iv) There was confusion on which knowledge to apply. v) Farmers did not know where to find local raw materials to use. vi) Some perceived that there was low efficacy where indigenous methods were used. vii) External information was perceived to be expensive. viii) There were cultural barriers. ix) Mixing was expensive.

Most of the barriers identified by the present study confirmed those of earlier authors (Chisenga 2002; Kaniki and Mphahlele 2002; Briggs 2005; Mihale *et al.* 2009). Kaniki and Mphahlele (2002:2) identified the barrier on lack of awareness on what local knowledge was available because it had not been popularised. Likewise, Chisenga (2002:17) noted that agricultural education and training curricula did not incorporate local knowledge hence there was low awareness on this knowledge system. On efficacy of local knowledge, Briggs (2005:3) cited a farmer in Tanzania who was dissatisfied with the application of local knowledge and said “*Kama elimu ya asili ni nzuri kiasi hicho, kwa nini shamba langu ni hafifu?*” (Kiswahili for “If indigenous knowledge is so good, why is my farm so poor?). However, it should be noted that farmers also get unsatisfactory results in applying scientific modern knowledge. For example, Turnbull (1997:559) observed that farmers in Indonesia that adopted western knowledge on high yielding rice experienced severe pest problems because of monocropping and had to resort to their local knowledge using IPM.

Others applied local knowledge as a first step that sometimes worked while at other times it did not work. The finding on confusion about which knowledge to use was confirmed by Briggs (2005:14) who observed that the divide between western and local knowledge still lingered on with different groups holding to their stereotypes. According to Briggs (2005), in practice farmers were willing to apply modern farming methods where they could afford to, but used whichever knowledge system worked and had economic and socio-cultural benefits.

Challenges experienced by farmers in the present study and other authors suggest that sources of local knowledge were scarce and that there was no systematic approach of encouraging farmers to mix and



no readily available information on how to mix, and these barriers discouraged innovation. In Ethiopia, farmers integrating local knowledge into the management strategies of the Borana pastoralists established that some local knowledge on pasture management was underutilised and was disappearing (Hofmann and Rischkowsky 2005:2,3). Middleton (2007:2) highlighted several barriers and constraints in Peru including competing labour demands for combining the two knowledge systems, small land sizes that made it difficult to practice some local farming methods such as crop rotation and shifting cultivation. Mihale *et al.* (2009:255) found that some farmers did not know what plant or animal materials or part to use, did not have guidelines on how to formulate the concoctions, and did not know the application rates.

Kristjanson *et al.* (2009:5048) identified the barrier of exclusion of farmers in policy debates, hence the needs and concerns of small-scale farmers were often not articulated in agriculture and information and knowledge related policies. A key lesson learned by Kristjanson *et al.* (2009:5048) was to recognise farmers as generators and co-producers of knowledge as they had a lot of untapped local knowledge that would benefit the scientific communities. This analysis showed that although farmers integrated external and local knowledge, they faced many barriers and constraints. The findings suggest the need for including relevant actors, including farmers to capture, record and share innovations on mixed external and local knowledge systems that had been tested and validated to overcome some of the barriers identified for the benefit of the wider community and for the benefit of future generations.

## **7.5 Summary**

Chapter six identified the agricultural information needs of small-scale farmers by gender, and addressed the information seeking behaviour. It highlighted how farmers integrated external information and local knowledge, reasons for mixing, and how the integrated information and knowledge helped farming. Further, it outlined the role of farmers' groups in facilitating the sharing of knowledge and information. The findings showed that farmers' groups and individual farmers needed information from diverse sources and on a wide range of topics on the production value chain, based on the enterprise they produced, location and the actors available on the ground. Mixed groups presented the broadest range of needs, and although male and female farmers shared similar topics in terms of needs, the ranking and weight attached to each topic varied, as did their seeking behaviours. Most information was shared orally along social and cultural lines. Both external information and local knowledge systems were important in farming and although farmers mixed the two types of knowledge, they faced many barriers and challenges.

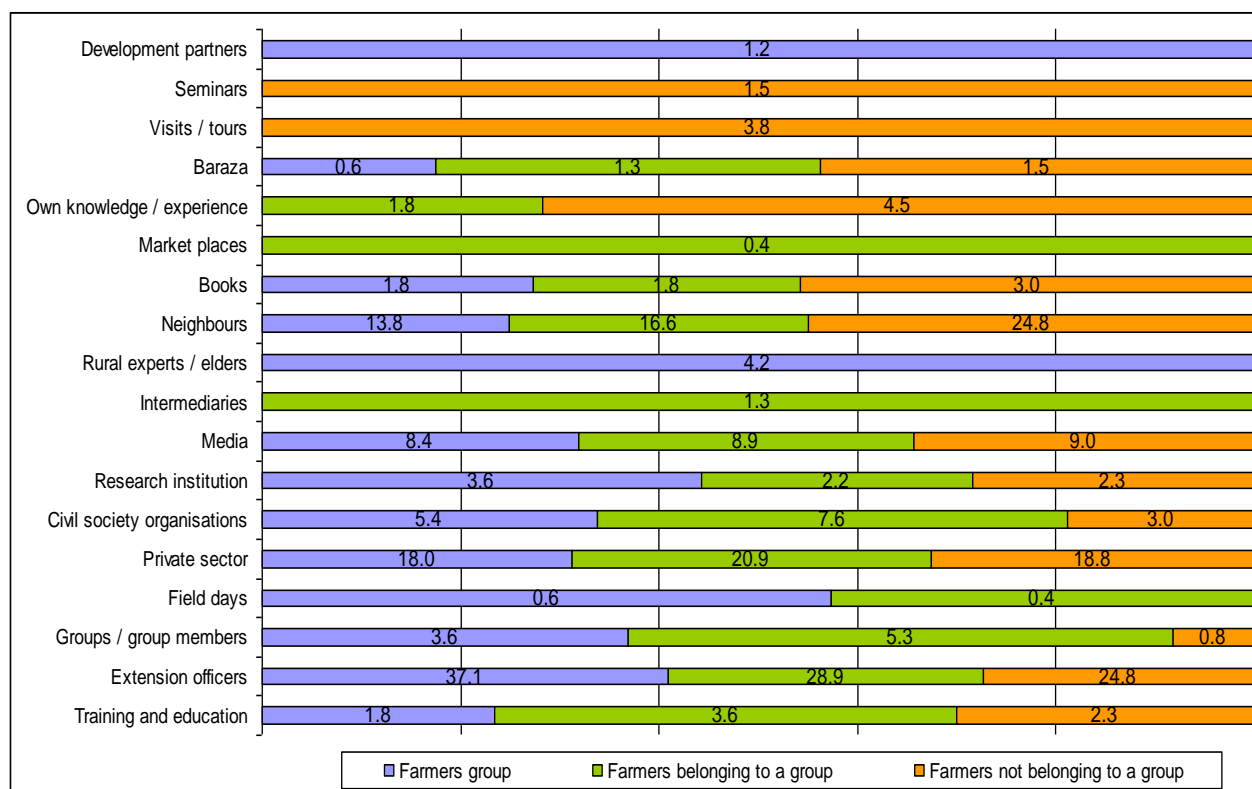
## CHAPTER EIGHT: MAIN SOURCES OF LOCAL KNOWLEDGE AND EXTERNAL INFORMATION

### 8.0 Introduction

This Chapter focuses on **research objective two: Identify sources of local knowledge and external information**. The Chapter presents and interprets findings on the main sources for agricultural advice, information and knowledge used by small-scale farmers (farmers belonging and not belonging to a group) and farmers' groups with special reference to sources for information on farming in general, specific enterprises, a new technology or farming practice, as well as for a farming problem. Next, this Chapter identifies the main sources of market information, how farmers and groups market their produce and presents a gender analysis of the main sources of information. Further, this Chapter identifies and applies the criteria used by farmers for determining their main sources of information and knowledge, assesses the quality of information obtained from the main sources of agricultural information and knowledge, and identifies the users of the knowledge and information. Finally, Chapter eight examines the AKISs of Kirinyaga district and the key features of the system. Data corresponding to the research questions under objective two was collected through questionnaires completed by information providers, interviews with farmers, key informants, representatives of relevant government ministries, research, training and education institutions, NGOs, CBOs and projects. Additional data was collected through focus group discussions with farmers' groups, observation, PRA and RAAKS (see **section 5.5**). **Sections 8.1 to 8.5** answered the **research question 2.1: *Where do farmers get their agriculture-related information?***

### 8.1 Main sources of advice and information and knowledge on farming in general

As discussed in **section 4.7.2**, farmers obtained agricultural information and knowledge to support their farming activities from diverse sources. **Appendix 51** summarises the major sources of information and knowledge in the four divisions and sample locations in Kirinyaga district. The study identified more than 48 sources of information and knowledge in the categories of producers, neighbours, public sector, the private sector, CSOs, international organisations and development partners. There were slight variations in the sources used by different types of groups and divisions because of the varied agroecological conditions in the district, the many enterprise(s) produced, and the actors who were active in the respective divisions, locations and sub-locations. The ticks in the spreadsheet presented in **Appendix 51** depict the presence of the particular source in the respective geographical area. Results from interviews conducted with farmers and focus group discussions with farmers' groups on the major sources for advice, information and knowledge in general showed that extension services, the private sector actors and neighbours were the major sources of agricultural information and knowledge. **Figure 23** depicts additional sources.



**Figure 23: Main sources for advice and information and knowledge on farming in general**

N=85 for farmers' groups, 100 for farmers belonging to a group and 70 for farmers not belonging to a group

### 8.1.1 Farmers groups' main sources of advice, information and knowledge on farming in general

Data collected through focus group discussions with farmers' groups revealed that i) extension (62, 37.1%) was the main source of advice, information and knowledge on farming in general for farmers' groups, followed by ii) the private sector (30, 18%) and iii) neighbours (23, 13.8%) (N=85 groups). Some farmers listened to the radio, watched TV, or read newspapers (14, 8.4%), while some groups sought information from CSOs, local experts, research institutions, farmers' groups, training and education institutions, books, development partners, barazas and field days (see **Figure 23**). As presented later in **section 9.1.12**, there were very few resource centres that provided access to agricultural information in Kirinyaga district.

### 8.1.2 Individual farmers' main sources of advice, information and knowledge on farming in general

The main sources for farmers belonging to a group (N=100, 225 responses) were similar to those identified for farmers' groups (see **Figure 23**), but the order of priority varied. The results for farmers belonging to a group showed that i) extension (agriculture, livestock and veterinary) (65, 28.9%) was

the key source; ii) the second most important source was the private sector (veterinary clinicians, agrochemical and seed companies, agrovets, horticultural exporting companies and KTDA) (47, 20.9%); followed by iii) neighbours, relatives and friends (35, 16.6%) then media (radio, TV, newspapers). In the case of farmers not belonging to a group (N=70), the priority in terms of how frequently the source was cited was extension (33, 24.8%), followed by neighbours, relatives and friends (33, 24.8%), the private sector (veterinary clinicians, agrochemical and seed companies, agrovets, horticultural exporting companies and KTDA) (25, 18.8%), and media (see **Figure 23**). The KTDA offered tea extension services.

The high rating of extension in Kirinyaga district may be explained by the wide coverage and penetration of extension services in the rural areas of this district. Extension services were well administered and coordinated at division, location and sub-location levels. Farmers perceived the information they obtained from extension services to be authoritative because extensionists were knowledgeable and well trained. Private sector actors such as horticultural exporting companies were perceived to be important because they visited farmers at their farms and provided markets for farmers' produce. Some provided training and inputs. Neighbours were considered important sources because of their proximity and their availability.

Good sources respond to the real and current information needs of the people (Rosenberg 2001:19), and community information services offered by information providers need to target the needs of specific communities (Kaniki 2001:190). The study findings showed that extension officers were the most important source of agricultural information and knowledge on farming in general used by small-scale farmers. Other important sources were the private sector, neighbours and other farmers. Similarly Giné (2005) found that the key source of information of the Drumnet groups in Gichugu division was extension, followed by friends and radio. Overall, the study findings on sources of farmers' groups and individual farmers confirmed many earlier authors (Bembridge and Tshikolomo 1998:24; Bachmann 2000:105; Rees *et al.* 2000; Stefano *et al.* 2005b; Karamagi Akiiki 2006), who found that farmers used diverse and varied sources for information, knowledge and skills to satisfy their information needs. Bembridge and Tshikolomo (1998:24) identified that the key sources for general information of fruit farmers in the Northern Province in South Africa were radio, demonstrations, farm discussions and other farmers. In Brazil, the main sources of information used by farmers producing the açai berry (a native palm) included local knowledge, community discussions with leaders, private investments projects, municipal development projects and research (Lewis 2008:296). Lewis (2008) pointed out that incentives to plant açai and the transfer of information was done through the sharing of seedlings among farmers.

In Fiji, Bachmann (2000:105) established that the major sources of information for farmers were extension, other farmers, radio, newspapers, magazines and market places, but that most farmers acquired agricultural skills during their youth from their parents and elders. Likewise, Daudu, Chado and Igbashal (2009:47) confirmed that in Nigeria, extension was the more preferred source of information of farmers, followed by friends and radio. Other authors (Mchombu 1993; Ngulube 2002:95; Stefano *et al.* 2005b:59; Sambodo 2007:169) were in agreement with Bachman (2000:105) that most farmers relied on information passed to them from older generations, and on personal experiences (Adomi, Ogbomo and Inoni 2003:390).

A comparison of the top three sources of the present study with the findings of the authors discussed above indicate that the key sources for farming in general differed between countries and geographic locations within a country. Sources perceived to be important depended on the actors who were on the ground and their relative importance and relationship with the community. For example, the present study's findings showed that the key source of information on farming in general was extension services. The role of extension was discussed in **section 4.5.2**, and some of the constraints in this sector were highlighted. To address some of the challenges faced by public extension services in Kenya, private sector extension services were established. A good example is the horticultural fresh produce sub-sector, which complements the public sector extension services (Nyambo and Nyagah 2006:10; Nyambo *et al.* 2009:100). The private sector extension services provided training (theory, practical sessions, visits and interactions with technical staff and with other farmers), mentoring, and linkages to other actors such as exporters, specialised technical experts and trainers. The private sector came second in importance for farmers' groups and farmers belonging to a group, while farmers not belonging to a group ranked neighbours in second position and the private sector third. These findings underscored the importance of interpersonal sources of information.

The findings of the present study on people as sources of information concurred with other studies (Kaniki 1989:132; Mchombu 1993; Stilwell 2002:74,76; Solano *et al.* 2003:5,7; Bagnall-Oakeley *et al.* 2004:122; Ngulube 2002:95; Nyumba 2006). For example, Kaniki (1989:132) established that most small-scale farmers in Zambia used their personal experiences, neighbours or friends or relatives as well as meetings or conferences. Ramirez (1997) suggested that other farmers were a primary source of information. Stilwell (2002:75) found that face-to-face sources were preferred even where other sources were available. Solano *et al.* (2003:5,7) found that family members and extensionists were the most preferred and trusted sources in Costa Rica. Many other authors recognised extension, advisory services and neighbours, relatives and friends as important sources for general information (Bachmann 2000:106; Mutua-Kombo 2001; Anderson and Feder 2004:42; Jensen, English and Menard 2009:4).

However, Stilwell (2002:67,73,76) noted that oral information services often excluded some members of the community and pointed out alternative options for delivering information such as resource centres. Many authors have demonstrated the importance of community libraries and information or resource centres or public access centres as sources of information in rural areas (Mchombu and Cadbury 2006:6; Ocholla 2006; Aina 2007; Ha, Okigbo and Igboaka 2008:403). As noted by Stilwell (1999:27; 2001a:200) rural resource centres were unique in that they offered services that addressed the livelihoods of rural communities; provided different and inexpensive content compared to that offered by traditional library services; and there were stronger ties between the information provider and users. According to Stilwell (1999; 2001a), the community library established linkages with other information providers to collect information resources and to provide information that responded to users' needs. Likewise, Kalusopa (2005:418) found that the main sources of agricultural information of small-scale farmers in Zambia were information centres established by the Zambia National Farmers Union (65.5%), followed by NGOs (63.9%) and extension (36.7%). In Nigeria, Ha, Okigbo and Igboaka (2008:403) showed that knowledge centres were effective in disseminating knowledge among rural farmers.

In contrast, the present study, and Ojiambo's (1989 cited in Ojiambo 1995:123) found that there were very few libraries and documentation centres providing agricultural information for farmers in Kirinyaga district and Kenya respectively. This slow pace of adoption of the resource centre concept denied small-scale farmers a space for interaction and deprived them of agricultural information and knowledge. These findings underscored the need to establish rural resource centres that were equipped with relevant content, in appropriately packaged format and language (see **section 4.7.5**). Lessons learned from the Bangprok boat library in Thailand on opening resource centres after hours to enable farmers and community members to access information (Ahmed 2009:508) need to be taken into consideration.

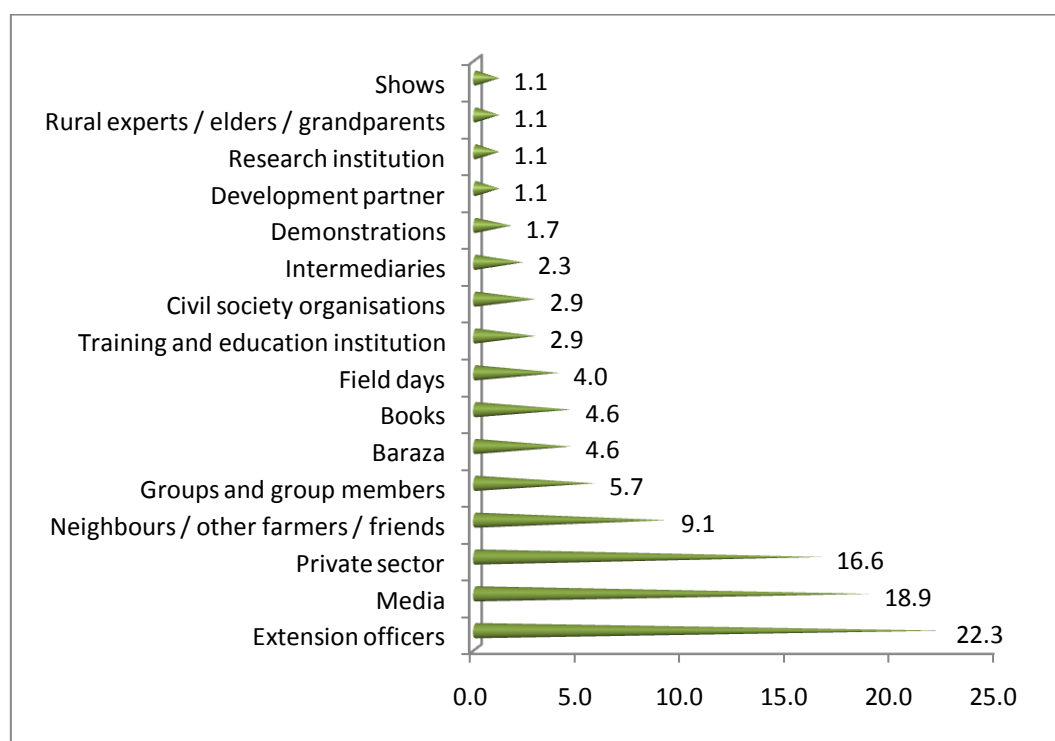
The present study found that some farmers relied on their own knowledge and experience for knowledge. Similar findings were observed by Steiner (1998:195-196), who found that farmers in Rwanda had a wealth of local knowledge that they used to manage their soils. They used their own criteria for classifying the soils in determining what to produce and were knowledgeable on farming steep slopes. In sum, the study findings showed that farmers used diverse sources of information for general agriculture information and highlighted the important role played by extension, the private sector and neighbours, other farmers, relatives and friends in the AKIS of Kirinyaga. The findings suggest a need for strengthening private and public extension services to co-exist and provide targeted complementary services.

## 8.2 Main sources of information and knowledge and the different purposes for which it is needed

Farmers' groups and individual farmers used different types of information depending on the purpose for which the information was needed, such as for news about a technology or farming system, to respond to a specific question, or for the main enterprise(s) of the group.

### 8.2.1 Farmers' groups main sources of news about a new technology, farming practice or market

Results showed that farmers' groups (N=87, 175 responses) mainly found out news about a new technology, variety, breed, farming system or how to control agricultural pests and diseases or markets from: i) extension officers (agriculture, livestock, fisheries or forestry) – visiting or calling them to train them (39, 22.3%), ii) the media (mainly radio but a few watched TV or read newspapers) (33, 18.9%), iii) the private sector institutions (representatives from agrochemical or seed or horticultural exporting companies, agrovets, KTDA, veterinary clinicians, or coffee factory) (29, 16.6%). **Figure 24** presents other sources of news, technology and farming systems or markets.



**Figure 24: Farmers' groups main sources for finding out news about a new technology, farming practice or market**

N=87



Sixteen groups (16, 9.1%) indicated that they asked neighbours, other farmers and friends. Ten groups (10, 5.7%) asked farmers' groups or group members. A few attended field days, demonstrations, shows, barazas, read books, magazines, pamphlets, brochures or posters, visited training and education institutions, learned from CSOs, intermediaries, development partner representatives that they worked with, experts or rural elders.

Extension officers were the most preferred source for news about a new technology or farming practice. Other preferences included media and private sector institutions. Considering that research institutions were the lead actors engaged in the generation of technologies, it was surprising that research institutions were not among the top ten sources of news about a new technology. Despite their limited availability, the findings of the present study depicted extension as the key source of information for finding out news about a new technology, farming practice or market, followed by media, the private sector institutions, neighbours, other farmers and friends, farmers' groups and group members. As pointed out by Bringe (2008:44), the media are crucial in delivering information about new technologies, strengthening networks and facilitating the sharing and exchange of ideas and experiences. These findings were similar to those by Ha, Okigbo and Igboaka (2008:400-401) in Nigeria, who identified the main sources for finding out agricultural related news as mass media (radio and TV), other farmers, the church, extension and seminars. In their study on attitudes of farmers and the importance they attached to people as information sources, Solano *et al.* (2003:9,17) confirmed the present study's findings to some extent. They found that farmers seeking information on new practices preferred to consult extension technical advisors and commercial agents, but some farmers learned about new practices from the media. The findings of the present study and those of other authors (Solano *et al.* 2003:9,17; Ha, Okigbo and Igboaka 2008:400-401) underscored the role of the media in providing news about new technologies.

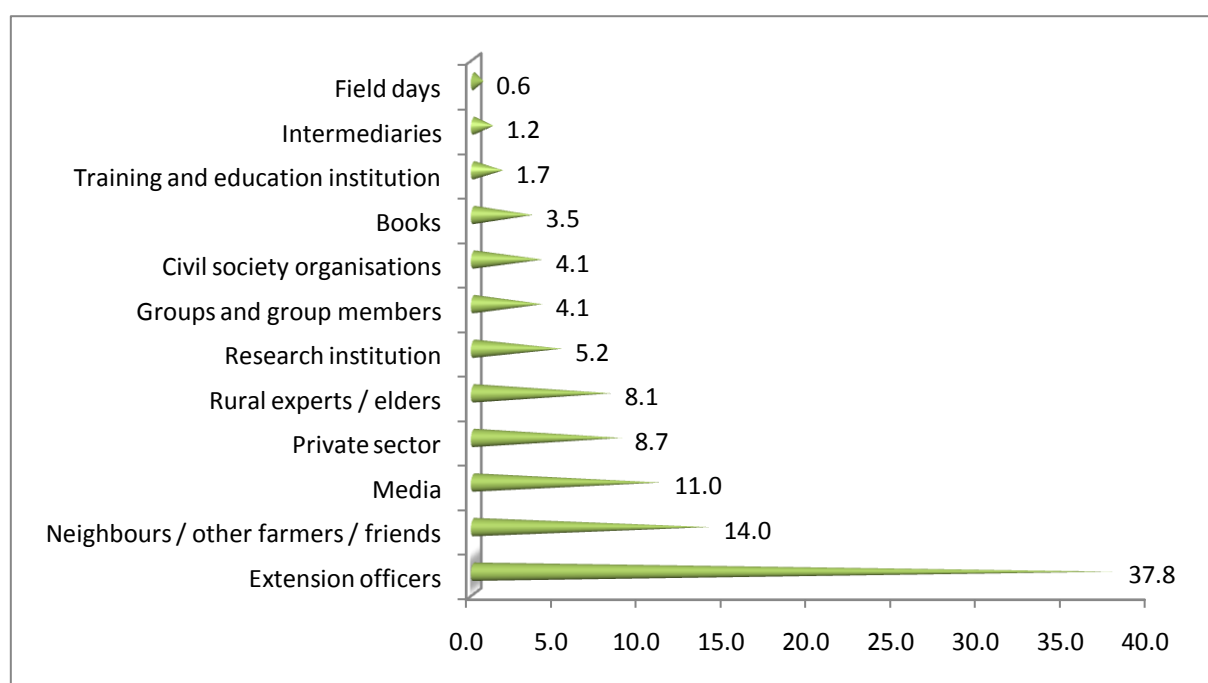
Neighbours emerged fourth in terms of providing information about a new technology or farming method. Some were role models in the community and tried out new technologies or farming methods based on what they had learned from different sources. Although a few neighbours were reluctant to share their knowledge assets with other members of the community, most neighbours shared what they knew with other members of the community on request. Most actors in rural communities worked with farmers' groups. Group members thus benefitted from interactions with different experts, training courses and visits, making them a good source of information for news about a new technology or farming system. The study findings showed that a few groups (4%) found out about a new technology, farming practice or market by attending field days. As observed by Kilpatrick (1999:19), field days created a forum for interaction with other actors and an opportunity to see new technologies and farming methods in practice. Field days were also an effective learning platform where farmers could observe, learn, share views, interact with others and expand their



knowledge base (Amudavi *et al.* 2009:232-233). Although only 1.1% of the farmers' groups in the present study obtained news from community leaders or rural elders, Lewis (2008:297-298) found that a few respected community leaders had the power to shape the local knowledge and land use strategies used by açai small-scale farmers in Brazil. In addition, Kanté *et al.*'s (2009:289) study in Mali underscored the influence and power of community leaders in disseminating important agricultural information and in influencing farmers. This finding suggests that information providers could work with influential community leaders when introducing new technologies or farming methods.

### 8.2.2 Farmers groups' main sources for answering a farming question

Results showed that when farmers' group had a farming question, the groups (N=87, 172 responses) mainly obtained information or advice from i) extension services (65, 37.8%), followed by ii) neighbours or other farmers or friends (24, 14%), and iii) media (radio, TV, newspapers) (19, 11%). Other key sources included the private sector, rural experts and shows (see **Figure 25**).



**Figure 25: Farmers' groups main sources for answering a farming question**

N=87

The findings of the present study showed that farmers' groups preferred to consult extension officers for advice and information on specific farming questions, followed by neighbours or other farmers. A study by Solano *et al.* (2003:9,817) supported the study findings that farmers mainly sought information problem solutions from technical extension advisors then family members. Stefano *et al.* (2005b:61) found that farmers chiefly obtained answers to specific farming problems from oral

communication channels, followed by print then electronic. These findings were explained by the Principle of Least Effort theory (Poole 1985:89-92,108; Case 2002:141; Bates 2005:4) (see **section 3.2.4.1**). The premise of this theory was that people tended to adopt the option that entailed spending minimum resources and effort. Farmers preferred oral sources from information providers who were locally available, such as extension, neighbours and other farmers, or radio and TV. This finding suggested that information providers need to take note of the importance of people's information sources including the mass media and repackage and disseminate information using communication channels that would require minimum time, resources and effort.

### **8.2.3 Comparison of main sources of information for different purposes**

Data on the main sources of advice, information and knowledge for farming in general differed slightly from those used for answering a farming problem and for finding out news about a new technology or market or farming system. While the key sources for agriculture in general for farmers' groups were extension, the private sector and neighbours, the main sources for finding out news about a technology or farming system were extension, radio and the private sector, and the key sources for answering a farming question were extension, neighbours and media respectively. The differences suggest that farmers' groups used different types of sources to meet their diverse information needs. Overall, it was observed that extension services emerged as the most important source in meeting the three types of needs.

### **8.2.4 Main sources of information, advice and knowledge by type of group**

**Table 4** illustrates the main sources of information and knowledge used by farmers' groups arranged by type of group.

The results showed that: i) The male only groups mostly obtained information from the private sector actors (4, 30.8%), followed by neighbours (3, 23.1%) and extension services (2, 15.4%). ii) The female only groups primarily sourced information from extension services (14, 48.3%), followed by neighbours (5, 17.2%), then media (3, 10.3%). iii) The youth only groups chiefly searched for information from extension services (4, 40%), followed by the private sector actors (3, 30%), and neighbours and development partners (1, 10% each). iv) Most mixed groups looked for information from extension services (42, 36.5%), followed by the private sector actors (18.3%), then neighbours (14, 12.2%).

**Table 4: An analysis of the main sources of information and knowledge by type of group**

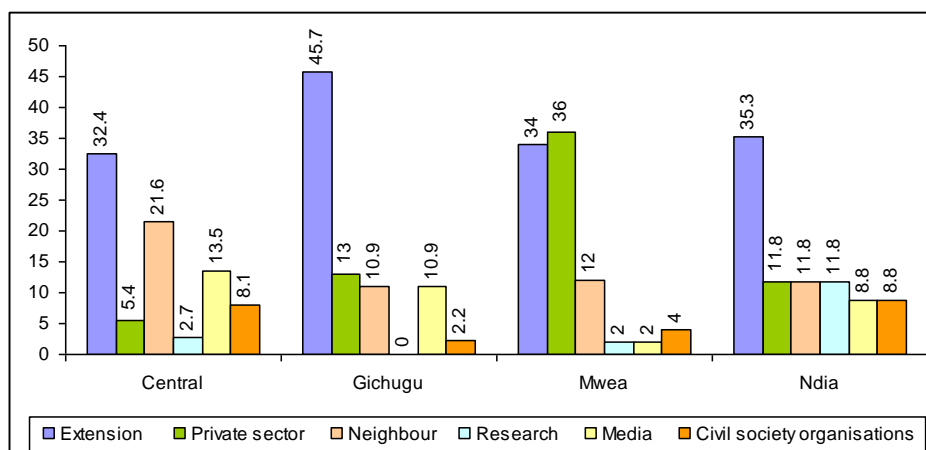
N=85

	Type of Group				Total
	Male only	Female only	Youth Only	Mixed	
Extension (public sector)	2 (15.4%)	14 (48.3%)	4 (40.0%)	42 (36.5%)	62
Private sector	4 (30.8%)	2 (6.9%)	3 (30.0%)	21 (18.3%)	30
Neighbours	3 (23.1%)	5 (17.2%)	1 (10.0%)	14 (12.2%)	23
Media	1 (7.7%)	3 (10.3%)	0 (0%)	10 (8.7%)	14
CSOs	0 (0%)	0 (0%)	0 (0%)	9 (7.8%)	9
Local experts	0 (0%)	0 (0%)	0 (0%)	7 (6.1%)	7
Farmers groups	0 (0%)	0 (0%)	1 (10.0%)	5 (4.3%)	6
Research institutions	2 (15.4%)	2 (6.9%)	0 (0%)	2 (1.7%)	6
Training and education institutions	0 (0%)	2 (6.9%)	0 (0%)	1 (0.9%)	3
Books	0 (0%)	1 (3.4%)	0 (0%)	2 (1.7%)	3
Development partners	0 (0%)	0 (0%)	1 (10.0%)	1 (0.9%)	2
Barazas	0 (0%)	0 (0%)	0 (0%)	1 (0.9%)	1
Field days	1 (7.7%)	0 (0%)	0 (0%)	0 (0%)	1
Total	13	29	10	115	167

The findings suggest that extension officers were the key source of information for all types of groups except the male only groups, whose main source was private sector actors. Neighbours were second for male only and female only groups but third for youth only and mixed groups. The private sector sources were second in importance for youth only and mixed groups.

### 8.2.5 Main sources for advice, information and knowledge by division

**Appendix 52** presents an analysis of the main sources for advice, information and knowledge on farming used by farmers' groups (N=85) in the four divisions of Kirinyaga district. The results showed some variations in the order of importance of sources used by farmers in the different divisions. While extension emerged the top source in Gichugu (21, 45.7%), Central (12, 32.4%), and Ndia (12, 35.3%) divisions, the private sector actors took the lead in Mwea division. An analysis of the top three sources for each division identified the key sources as: (see **Figure 26**): i) Central – Extension (12, 32.4%), neighbours (8, 21.6%) and media (5, 13.5%). ii) Gichugu – Extension (21, 45.7%), the private sector (6, 13%), neighbours and media (5, 10.9% each). iii) Mwea – The private sector (18, 36%), followed closely by extension (17, 34%) and neighbours (6, 12%). The importance of the private sector in Mwea was probably because of the availability of irrigation water and the production of horticultural crops in the irrigated lowland terrain, which attracted horticultural exporting companies that were working with farmers. Although a KARI research station was located in Mwea it did not feature among the top three sources for the division (see **Figure 26**). iv) Ndia – Extension (12, 35.3%), the private sector, neighbours and research (4, 11.8% each).



**Figure 26: Analysis of top three sources of farmers' groups for advice, information and knowledge by division**

N=85

Other than the sources identified above through focus group discussions with farmers groups, additional data for each division was collected using the RAAKS Knowledge network analysis of sources (see **Appendix 51**) and the Knowledge network analysis of use made of key sources (see **Appendix 129**). For example, although data collected from focus group discussions with farmers' groups did not highlight training and education institutions and financial institutions as key sources in Central division, these sources were highlighted by the RAAKS analysis of sources. Additional sources identified for Gichugu and Mwea divisions included farmers' groups.

Some of the sources identified through focus group discussions and RAAKS tools were confirmed by the timelines of agricultural activities from various divisions and sub-locations. Timelines (see **section 5.5.1.2**) helped to visualise and put the key sources into the larger context of agricultural activities in the area across space and time. The timelines highlighted some of the sources that the local people (mainly elderly people) perceived and recalled as important over time in chronological order. For example, the timeline (PRA) of Kamunyange sub-location in Mwea division highlighted extension (from the 1980s); agrochemical companies (2007), traders, brokers, markets and radio (2003), agrochemical companies (2007), and Equity Bank (2007) (see **Appendix 53**).

Although the timeline for Kithumbu sub-location in Ndia division highlighted extension, the private sector and media, it was silent on neighbours and research (see **Appendix 54**), which were identified through focus group discussions with farmers' groups. These findings were also confirmed by data collected using the Services and Opportunity maps (PRA) for Gitaku and Kariini sub locations (see **Appendix 55** and **Appendix 56**), and the RAAKS inventory of major sources in **Appendix 51**, and expanded the sources for Ndia division to include transporters, brokers and markets. On the other

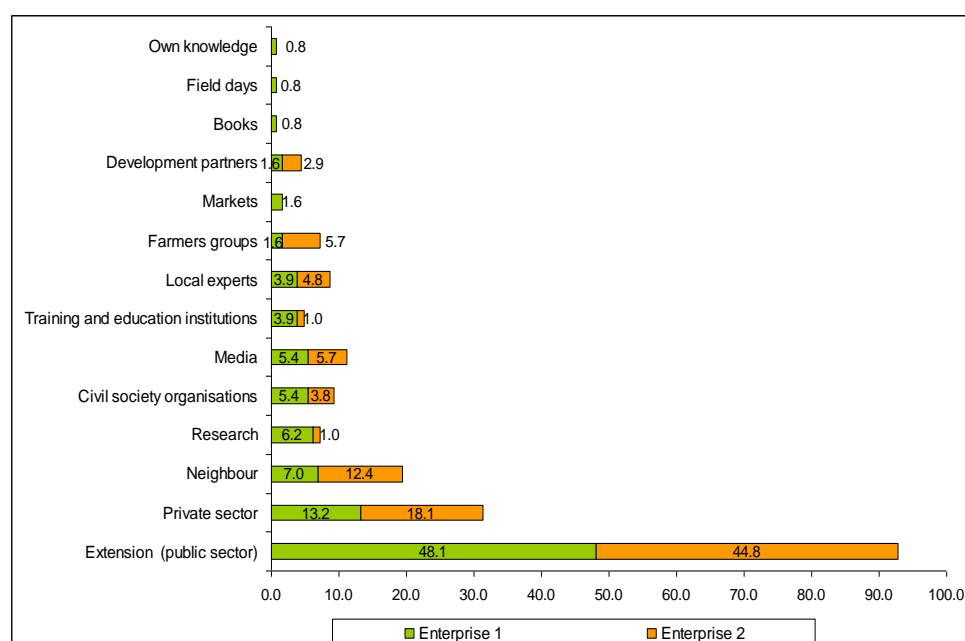
hand, **Appendix 55** portrays extension as the main source (largest circle), the private sector (Tropical Farm Management and input suppliers) and research (KARI, ICRAF and ILRI. The DGAK represents the CSOs. The complementary information identified by the alternative methods confirmed the advantages of triangulating data collection methods and the synergy of multiple methods (see **section 5.2** and **5.5.1**).

## 8.2.6 Main sources for agricultural information and knowledge for the enterprises ranked priority number one and two

Farmers' groups, farmers belonging and farmers not belonging to a group used similar sources of information and knowledge. There were some variations depending on the choice of enterprise(s). While some groups and individual farmers relied on a few key sources, others used a broader range of sources to address their needs for a particular enterprise(s). The main enterprises produced by farmers' groups and individual households were presented in **section 6.5**.

### 8.2.6.1 Farmers groups' main sources for information and knowledge for the enterprise ranked priority number one and two

**Figure 27** demonstrates the fairly uniform pattern of main sources for advice, information and knowledge for the agricultural enterprises ranked priority number one (N=86 farmers' groups) and two (N=69) farmers' groups.



**Figure 27: Main sources of information and knowledge of farmers' groups for enterprises ranked priority number one and number two**

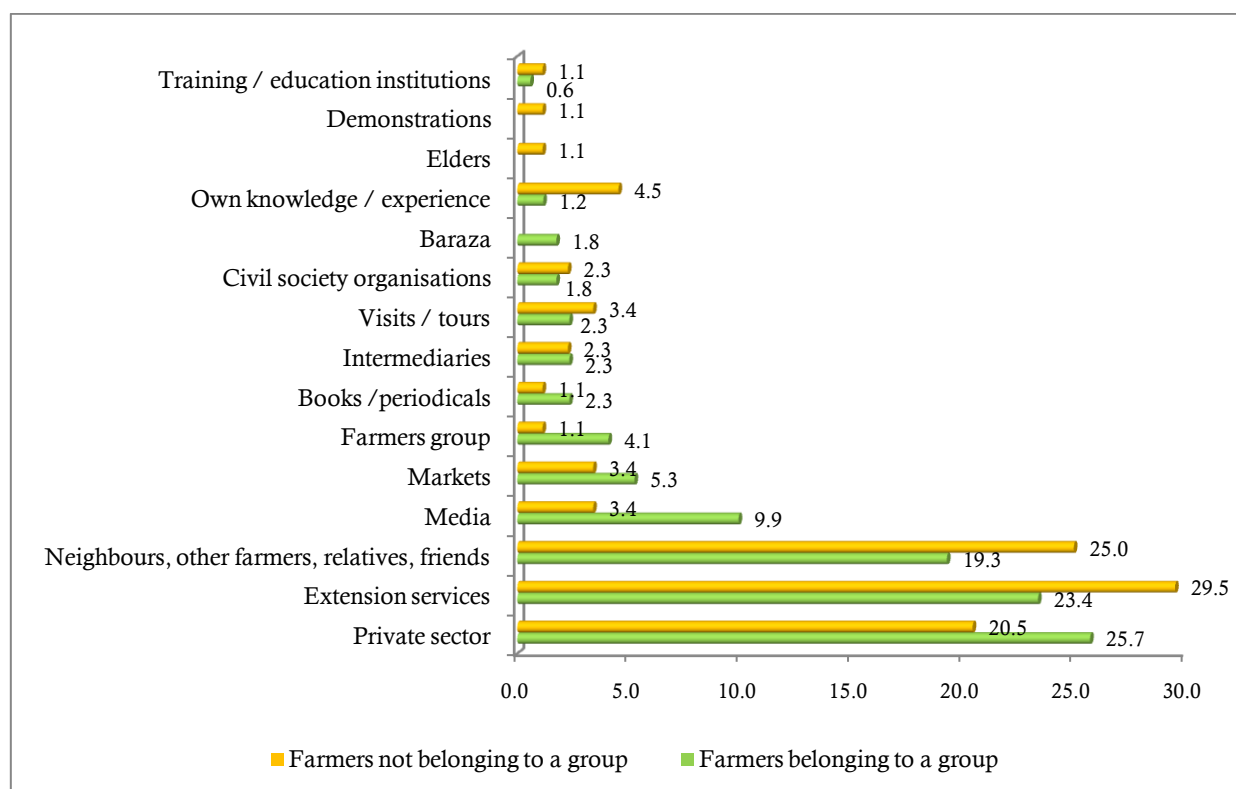
N=86 for the enterprise ranked priority number 1, N=69 for the enterprise ranked priority number two

The key sources for information for the enterprises ranked priority number one and two were i) extension (62 responses, 48.1% for enterprise ranked priority number one and 47, 44.8% for the enterprise ranked priority number two), ii) the private sector (17, 13.2%, and 19, 18.1%) and iii) neighbours (9, 7% and 13, 12.4%) respectively. **Figure 27** presents other key sources for the two enterprises. Farmers' groups used a slightly broader range of sources for the enterprise ranked priority number one than for number two. Apart from the sources that were common to the two enterprises, farmers' groups relied on their own knowledge and experience, field days, books and markets for information and knowledge for the enterprise ranked priority number one. It was observed that farmers' groups used extension sources more to access information for their main enterprises than general agriculture (48.1% and 44.5% for enterprises one and two versus 37.1% for general agriculture) (see **section 8.1.1**).

#### **8.2.6.2 Main sources for agricultural information and knowledge used by individual farmers**

Results on the main sources of information and knowledge for the enterprises ranked priority number two by individual farmers belonging to a group and those not belonging to a group corroborated those of farmers' groups. However, there were some differences in the order of importance of sources consulted for the enterprise ranked priority number two (see **Figure 28**). The three key sources of information and knowledge for the enterprise ranked priority number two by farmers belonging to a farmers' group (N=93, 171 responses) were: i) the private sector actors (44, 25.7%); ii) extension services (40, 23.4%) and iii) neighbours and other farmers (33, 19.3%). Other important sources of information and knowledge for farmers belonging to a group included the media, markets, farmers' groups, books and periodicals, intermediaries, visits and tours, CSOs, barazas, own knowledge and training and education institutions.

The top three sources of information and knowledge for farmers not belonging to a group (N=59, 88 responses), were: i) extension services (26 responses, 29.5%), followed by ii) neighbours (22, 25%) and iii) the private sector actors (18, 20.5%). Other sources are presented in **Figure 28**. Overall, extension emerged as the most important source of information and knowledge for farmers not belonging to a group, unlike, in the case of farmers belonging to a group, where the private sector was the lead source.



**Figure 28: Main sources of information and knowledge of farmers for enterprise ranked priority number two**

N=93 for farmers belonging to a group and N=59 for farmers not belonging to a group

The present study's findings highlighted extension services, the private sector actors and neighbours as the main sources of information for farmers' groups and individual farmers for the enterprises ranked priority number one and two. Other important sources included the media, markets, farmers' groups, visits and tours, intermediaries, print materials and CSOs. The DGAK categorised under CSOs emerged an important source of information for dairy goat farmers in Kirinyaga district. Stefano *et al.*'s (2005b:59) study of organic small-scale farmers' groups from the Embo community in South Africa producing horticultural produce, fruit and culinary herbs highlighted the importance of CSOs and showed that the main sources of agricultural information and innovation for organic farmers were intermediaries from NGOs, church organisations, researchers and extensionists. In their study of poultry farmers in Ghana, Chisenga, Entsua-Mensah and Joel (2007:8) found that the poultry farmers association was the key source of information of small-scale poultry farmers, followed by other farmers. Field days, media, farmers' groups and group members also emerged as important sources of information in the present study. However, despite the many sources that provided information and training, Van Den Berg and Jiggins (2007:663,676) observed that not enough systematic effort had been devoted to providing learning opportunities to farmers.

### **8.3 Main sources of market information**

This sub-section presents results and interprets findings on the main sources of market information of farmers' groups and individual farmers. Data on sources of market information was collected through focus group discussions with farmers' groups, questionnaires completed by information providers, and interviews with farmers, key informants, CSOs, government ministries, and research, training and education institutions as well as through PRA tools, RAAKS windows and observation.

#### **8.3.1 Main sources of market information of farmers' groups**

Farmers' groups sold the produce of members through different marketing channels and obtained marketing and price information from various sources.

##### **8.3.1.1 How farmers' groups marketed the produce of members**

Farmers' groups (N=87 groups, 127 responses) marketed their produce and that of group members in different ways. Twenty three (23, 20%) had formed marketing groups and sold members' produce collectively, and contracts were signed by group officials on behalf of their groups. However, some farmers felt that the contracts favoured the exporters as farmers were not involved in the drafting of the contracts. Fifteen (15, 13%) took farmers' produce to the local markets, while 14 (12.2%) sold their produce individually. Some sold their produce through intermediaries (brokers, middlemen) (11, 9.6%) while others (10, 8.7%) sold the produce to members of the community. Farmers who marketed their produce collectively often collected the produce of members at a central shed, where it was sorted, graded and weighed before being transported by horticultural exporting companies.

However, the marketing of farmers' produce depended on the enterprise(s) of the group. For example, groups dealing with tree / fruit seedlings sold their produce at the nursery sites, markets or to the Greenbelt Movement, through the CDF, forest officer, KATC and institutions such as hospitals and schools. Coffee was sold through coffee factories, cooperatives, and societies. It was observed that there were very many coffee cooperatives and factories in Kirinyaga district. Some were privately owned while the majority were owned by cooperatives, while others were defunct due to mismanagement by leaders or disagreements with members. Tea and cotton were sold through the KTDA and Mwea ginnery respectively. While some horticultural produce was sold directly to exporting companies, some was marketed through intermediaries to exporting companies. Bananas were sold through groups (group marketing) or through intermediaries. It was observed that some produce was sold at the farm gate to traders, neighbours and other community members, especially where quantities were small and it was not economical to transport the goods to the market.

Groups that engaged in the pig enterprise sold their produce to nearby butcheries or slaughter facilities, while the dairy goat groups sold kids and goats to the DGAK and at goat auctions. Dairy



goat milk was consumed by the household and some was sold locally to neighbours. Cow's milk was sold to neighbours and processing plants such as the Kenya Cooperative Creameries (KCC) and Brookside, through intermediaries or milk bars. Some service providers such as Africa Harvest provided market linkages for farmers' produce. For example, the TCB farmers were linked to TechnoServe who linked farmers to markets. Members of the group assembled their produce at a central place from where the buyer collected and transported them.

The bottom line in all farming operations is cash in the farmers' pocket, hence the produce from the various enterprises produced by small-scale farmers needs to find its way to reliable markets that attract better prices. Market information provides guidance to farmers on what to produce, when to produce and where and when to sell. Despite its importance, the findings of the present study revealed that with the exception of a small number of actors working on a few enterprises such as tissue culture bananas, dairy goats, tea and coffee, there were no deliberate efforts by actors to link farmers to markets and market information. Emphasising the importance of market information, Pokhrel and Thapa (2007:161) asserted that farmers who were well informed about the prices of agricultural produce were unlikely to be cheated by intermediaries. Findings of the present study showed that farmers' groups mainly sold their produce through group marketing and outgrower<sup>71</sup> arrangements. Some horticultural exporting companies operating in Kirinyaga district offered packages of training, inputs, spraying services as well as marketing of produce. In contrast, the Agricultural Cooperative Development International and Volunteers in Overseas Cooperative Assistance (ACDI/VOCA) project (2009) in Tanzania and Kenya worked with farmers, and private sector actors who provided training on production and international standards, inputs and market infrastructure. The project involved small-scale farmers, farmers' associations and buyers in the drawing of contracts for the high value horticultural produce. The outgrower arrangements enhanced productivity and strengthened market linkages.

Group marketing was found to be more efficient and cost-effective because the larger quantities of produce attracted better markets and prices (economies of scale). Besides, farmers shared many services and facilities such as sorting and weighing at the central shed. For example, Frigoken had established contract agreements with farmers whereby they supplied farmers with inputs (seed, fertilisers and agrochemicals) and the cost of inputs was deducted before payment at the end of the planting season. The produce of individual farmers in each group was weighed and was marketed jointly (Kimenye 2005:153). This marketing approach was similar to Adendorff's approach in South Africa, which bundled support services such as training, ploughing, inputs, and marketing. The

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<sup>71</sup> Outgrower arrangements or schemes are defined as contract partnerships between producers and a company that purchases the produce. The farmers obtain production and marketing services in the form of inputs on credit and technical advice from the contractor and the contractor in turn buys the produce. The contracts include different agreements on sharing of production and marketing risks and benefits. The contracts are usually formal and may be short or long term.

linkages to support services facilitated coordination of farming activities and contributed to the success of the programme (Meyer 2000:156).

Despite the advantages of group marketing through contracts or outgrower programmes, Bingen, Serrano and Howard (2003:411-412) demonstrated a more sustainable approach based on human capital development and provided empirical evidence from Cameroon, Mali and Mozambique. Bingen, Serrano and Howard (2003) emphasised the need for strengthening the human capacity of groups to facilitate the adoption of new technologies, manage the distribution of inputs, production and marketing of produce. According to Bingen, Serrano and Howard (2003:411-412), the approach of investing in “process/human capacity” was more sustainable as it decentralised power and promoted participatory decision making that strengthened the local community. The “process/human” approach also overcame fears of cancellations or pull-outs by the contracting or outgrower firms.

The present study showed that many groups marketed their produce such as coffee, milk and horticultural produce through cooperatives, societies and factories. One such marketing cooperative in Kirinyaga district was the Kibirigwi Irrigation Farmers Cooperative Society (KIFCO), which assembled diverse produce from farmers including milk and horticultural produce. KIFCO provided facilities to members for sorting, grading and weighing their produce, and a yard for intermediaries and transporters that bought or transported the produce. In comparison, Chambo (2009:3,8-9) observed that agricultural cooperatives such as the Kilimanjaro Native Co-operative Union in Tanzania had helped farmers in the Kilimanjaro area to attain premium prices through branding and marketing of their coffee as “organic.” The issue of branding was a critical point, which was also expressed by the Ezemvelo Farmers’ Organisation in South Africa (Darroch and Mushayanyama 2009:104). In Ethiopia, agricultural cooperatives benefitted group members and neighbouring non-member farmers, who participated in training, information sharing and assemblage and marketing of their produce. This joint approach helped farmers to reap the benefits of economies of scale (Bernard and Spielman 2009:64).

On milk marketing, the present study confirmed the findings of Holloway *et al.* (2000:6,18), who showed that small-scale dairy farming was an important source of revenue for subsistence farmers in Eastern Africa. Empirical evidence from Ethiopia showed that milk marketing groups had been established to market raw milk and processed milk products, which were sold to traders and local consumers. Holloway *et al.* (2000) emphasised the importance of milk groups in localised areas to reduce travel time and proximity to markets. Confirming the importance of proximity of service providers, Kibaara *et al.* (2009:51) showed that the proximity of public and private extension service providers was critical to their popularity.

In determining how farmers marketed farm produce, Barham and Chitemi (2009:57) observed a correlation between the age of the group and how marketing was done. They established that groups that were more mature (65%) were better placed to tap into market opportunities than the newly established groups (43%) because they had more connections and could access resources more easily. Some of the more successful groups in marketing in Kirinyaga district included the Baricho vegetables and fruits group, which was established in 1996, and KIFCO, which was established in 1978 to assist farmers to market their produce and obtain technical know how (see **section 6.3.1.4**). These well established groups represented good examples of group cohesiveness, had better access to market information, more market power and lower marketing costs because of advantageous contacts and market linkages they had established over the years. Neubert *et al.* (2007:44) pointed out that cooperatives were one key avenue for small-scale farmers for improving market access, power and efficiencies. Despite the benefits of collective action through cooperatives, Chambo (2009:10) noted that many cooperatives faced challenges of leadership, management and governance. These findings underscored the need to shorten the marketing chain by providing price and market information to farmers, and to strengthen the management of cooperatives and associations.

The finding on contracts drawn between horticultural exporters and farmers' groups being unfair, points to the need to identify the key actors in the market system, especially those who were excluded from the network, such as individual farmers belonging to a group in the case of the present study and to "grow" trust between the different active players. Most farmers' groups felt exploited and some perceived that the leaders who signed the contracts without consulting them were making material gains. As pointed out by Lyon (2000:678), it was not only important to identify actors that were excluded but those who had established "dependency relationships" that benefitted them but exploited others. This finding suggests the need for intervention by government and other relevant actors in linking farmers to markets and in supporting farmers' groups that were excluded from the drawing up of contracts by assisting in the re-drawing of contracts and providing full market information to farmers.

#### **8.3.1.2 Marketing outlets of farmers' groups**

Farmers' groups (N=86) were asked to state where farmers marketed their produce. Other than the enterprises marketed through groups, farmers sold their other goods produced individually through various outlets. Twenty seven (27 responses, (25%) indicated that they sold their produce to community members through local markets, the group or group members or community members at the homestead (19, 17.6%), at the farm gate to brokers and traders and to international markets through exporting companies (18, 16.7% each). Other smaller outlets included hotels and milk bars (9, 8.3%), the cotton ginnery, factories and cooperatives (4, 3.7% each), milk processing companies,

DGAK (2, 1.9% each), Forest department, neighbouring districts, and through NGOs and training institutions (1, 0.9% each). Coffee was sold through cooperatives but a few farmers indicated that they sold their produce to traders who offered higher prices, while tea was marketed through tea factories under the KTDA.

The findings of the present study on the importance of local markets confirmed results obtained by Dijkstra (1996:27) in Kenya, who found that farmers assembled and sold their commodities at the local markets or at the farm through intermediaries who then took the produce to markets in the larger towns. Among the reasons for the preference of local markets included: i) farmers could carry out transactions using their local language, which may not be understood by most market actors in town markets; ii) reduced transport costs; iii) reduced cost for information, and iv) market efficiencies. In a similar study in Japan, Tijani and Yano (2007:197,198) showed that female farmers who were disadvantaged in gaining access to markets participated in the direct farmer's market near their homesteads. For them, the benefits of the direct farmer's market were proximity to their farms, quick sale of their produce, control on prices and income generation.

The present study's findings showed high involvement of the private sector and brokers in Mwea, and the horticultural sub-sector in general, who provided market linkages to export markets through contracts. Similar findings were highlighted by other authors (Kariuki, Obare and Birachi 2006:841) in Kenya. The findings of the present study on the outlets of dairy products were consistent with those identified by Muriuki *et al.* (2003:10), which included cooperatives, milk bars, intermediaries, traders and other farmers. Statistics from the Kenya Dairy Board (2010) show that there are more than 1138 licensed milk bars selling fresh milk and milk products in major towns in Kenya. These findings imply that there was a need for the development of policies that support the marketing of agricultural produce of small-scale farmers, including road infrastructure, access to credit, access to information on better markets and prices. As pointed out in the Kirinyaga district development plan, the roads were impassable during the rainy seasons (RoK. Ministry of Finance and Planning 2002a:21). An area for further study would be to study the market chain of major commodities and the information needed at the steps in order to improve returns and livelihoods of farmers.

#### **8.3.1.3 How farmers' groups found marketing and price information**

Most farmers' groups (N=82) found marketing and price information by visiting local markets (20 responses, 18.3%), asking neighbours (18, 16.6%) and intermediaries (15, 13.8%). Others obtained market information from coffee factories, cooperative societies, local butcheries, other farmers' groups, horticultural exporting companies, development partners, the internet and the Horticultural Crops Development Authority (HCDA). NGOs, barazas, the CDF, the media, and research institutions were other important sources (see **Appendix 57**).

Farmers' groups in Central division mainly obtained market and price information from local markets, their farmers' group and intermediaries. Groups in Gichugu division obtained market information from intermediaries, local markets, farmers' group, neighbours and the CDF. In Mwea, most groups obtained market information from local markets, intermediaries, horticultural exporting companies and the cotton ginnery while the main sources of market and price information in Ndia were local markets, intermediaries and HCDA (see **Appendix 57**).

The findings of the present study on markets as the key source for marketing and price information was confirmed by Lightfoot and Scheuermeier (2006:6), who established that farmers' groups in Tanzania mainly obtained market information by visiting markets, using cellular phones and SMS, and asking other farmers. They established that farmers' groups used billboards and formed market research committees. Some groups increased market access by acquiring group cellular phones, which they used to contact transporters and buyers, printed leaflets, used radio and market information centres. Lightfoot *et al.* (2008:13) explained that the “*shushushus*”<sup>72</sup> gathered market intelligence on markets and prices through personal visits, use of cellular phones and the internet, which was then shared with other group members. According to Lightfoot *et al.* (2008), this practice had enabled farmers in Tanzania to earn impressive profits.

Although not used in quite the same manner, findings by the present study showed that some farmers' groups and individual farmers used the cellular phone to access market information by telephoning contacts at key markets while very few used the KACE SMS market information service. Given the exponential growth and penetration of the cellular phone in Kenya (see **section 9.5.4**), the findings of the present study and those of other authors (Lightfoot *et al.* 2008:13) pointed to the huge potential of cellular phone applications to improving delivery of market information and agricultural information in general. Farmers in Kirinyaga could adopt innovative methods such as the “*shushushus*” in Tanzania and other initiatives such as “Soko hewani” (Kiswahili for supermarket on air), and Foodnet, and improve usage of sources such as KACE and NAFIS in Kenya (see **section 2.2.4.3** and **section 4.7.3.2**) to improve access to market information.

### **8.3.2 Main sources of market information of individual farmers**

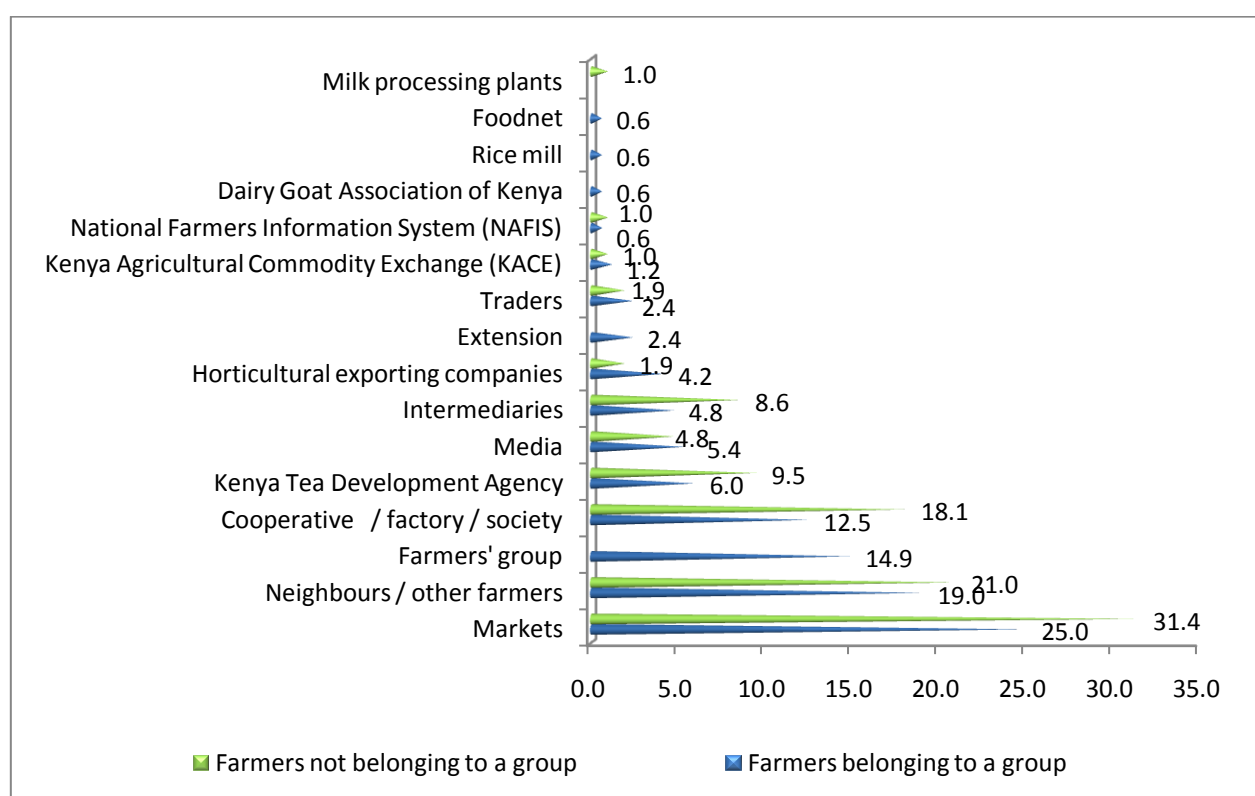
Individual farmers belonging and not belonging to a group used similar sources of market information and prices for the enterprises ranked priority number one and enterprise two with minor variations (see **Figure 29** and **Appendix 58**).

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<sup>72</sup> Shushushu is a Kiswahili word for market spies.

### 8.3.2.1 Individual farmers' main sources of market information for the enterprise ranked priority number one and two

The main sources of market information for the enterprise ranked priority number one by farmers belonging to a group (N=99, 168 responses) included i) markets (42, 25%), ii) neighbours and other farmers (32, 19%), iii) farmers' group (25, 14.9%) and cooperative societies and factories (21, 12.5%). Other sources of market information are depicted in **Figure 29**. The main sources used by farmers not belonging to a group (N=67, 105 responses) for the enterprise ranked priority number one were: i) markets (33, 31.4%); followed by ii) neighbours and other farmers (22, 21%); and iii) cooperatives, factories and societies (19, 18.1%). A comparison of the results of the two categories of individual farmers revealed that markets such as the Kagio and Kutus emerged as the top source for market and price information for the enterprises ranked priority number one and two. Other sources included the KTDA, intermediaries, media (radio, newspapers and TV), horticultural exporting companies, extension, traders, KACE, NAFIS, DGAK, rice mills, Foodnet and milk processing companies.



**Figure 29: Main sources of market information of individual farmers for the enterprise ranked priority number one**

N= 99 for farmers belonging to a group, N=67 for farmers not belonging to a group

A close examination of the results presented in **Figure 29** showed that farmers belonging to a group used a broader range of sources than farmers not belonging to a group did. It was observed that not many farmers used media sources to access market information. As one farmer remarked “The



market information we get from the media refers to prices of commodities in the major towns but we are interested in prices at our local markets.” Results for the enterprise ranked priority number two for both categories of individual farmers were consistent with those obtained for the enterprise ranked priority number one above, but cooperative societies and factories took third position for both categories of individual farmers (see **Appendix 58**).

In sum, the findings revealed that markets, such as the Kagio and Kutus markets were the key source for market and price information for the enterprises ranked priority number one and two. Findings from PRA tools namely Service and Opportunity maps, timelines and Venn diagrams confirmed the sources of market information identified above, and highlighted the specific markets where farmers sold their produce, as shown in **Appendix 53** to **Appendix 56**. The RAAKS windows for knowledge network analysis of main sources and of use (see **section 10.2** and **Appendix 129** to **Appendix 133** and **Appendix 135** to **Appendix 138**) also highlighted markets as sources of information. Some farmers said they relied on the market for price information because it was the only source that provided them with local market and price information.

Providing basic market information such as prices of commodities and market demand conditions increases agricultural market efficiencies, hence assists in averting market failures and information asymmetries in the market place (Ferris, Engoru and Kangazi 2008:1). However, various authors (Collinson *et al.* 2003:27; Bagnall-Oakeley *et al.* 2004; Mukhebi *et al.* 2007:23; Braun *et al.* 2007:19) have highlighted the lack of or limited market information in rural areas. The study showed that the main sources of market information were markets, neighbours and other farmers, cooperatives and societies and farmers’ groups. The sources established by the present study were similar to those obtained by other authors (Bagnall-Oakeley *et al.* 2004:123; Davis 2004:186; Ferris, Engoru and Kangazi 2008:7), although the order of importance of the sources varied. The study findings demonstrate the significance of being connected through inter-personal communication through other farmers, farmers’ groups, cooperatives or associations in facilitating the sharing and exchange of market information. These findings imply that institutions such as markets and farmers’ groups needed to be strengthened to provide relevant market content that was current and comprehensive.

Davis’s (2004:186) study in Kenya affirmed the importance of cooperatives and associations, and pointed out that the DGAK was an important source of information for dairy goat farmers while the Meru Goat Breeders’ Association provided information and marketed breeding material. Bagnall-Oakeley *et al.* (2004:123) found that the main sources and market information in Uganda were family, friends, neighbours and traders. In contrast, Ferris, Engoru, Kangazi’s (2008:7) findings in Uganda showed that radio was the main source of market information, followed by traders, family and friends. In their study in Ghana, Chisenga, Entsua-Mensah and Sam 2007:9) established that the

main sources of market information for poultry farmers were other farmers and the poultry association. What emerged from the study findings was that the market information shared through the existing information systems, including the media such as radio and newspapers did not have local market information that was relevant to the needs of the many farmers who sold their produce at the local markets.

Ferris, Engoru and Kangazi (2008:1) noted that the provision of market information was mainly offered by government through channels such as radio, newspapers, internet, e-mail, cellular phone, notice boards, traders and government officials. **Sections 4.7.2** and **4.7.3.2** presented other market initiatives in Africa (including MISTOWA, which has a reach in East Africa and KACE in parts of Kenya) that were managed through government and private sector partnerships. KACE offered the “Soko hewani,” which offered market information and provided a platform for linking buyers and sellers of inputs and agricultural produce through a local FM radio station and an intermediary in Western province, Kenya (Munyua, Adera and Jensen 2009:6). Although it is widely acknowledged that ICTs had enhanced markets and made them more accessible (see **section 4.7.3.2**), the present study established that there was very little usage of information systems such as KACE, Foodnet and NAFIS (see **section 2.2.4.3**).

A study conducted by Storer, Thunder and Murray-Prior (2001) in Australia highlighted the lack of knowledge, skills and understanding on how to use the tools as one of the reasons why price risk tools (electronic, oral and print) were not used by farmers. According to Storer, Thunder and Murray-Prior (2001), farmers used specific sources based on the purpose for which they needed the information. For example, farmers used different sources when learning about markets from those who wanted to keep abreast of market prices. These findings suggest the need to find out what market information farmers needed and how they wanted it to be disseminated. With respect to existing market information systems, the study findings suggest the need to train farmers on how to use them. In addition, the high investment in the development and management of market information systems and the low usage of the systems suggest a need to investigate why farmers were not using them. An area for further research would be to investigate the use and lack of use of existing market information systems, and to understand what sources were being used or not used and the reasons for their use and non use by farmers.

It was observed that the different market information systems were all stand alone and offered similar services, leading to duplication of effort. This finding indicated that there was a need for collaboration between institutions developing and managing market information systems, and to build upon existing systems for improvement and expansion instead of duplicating efforts.



### **8.3.2.2 A gender analysis of the main sources of market information**

An analysis of the main sources of market information of small-scale farmers by gender showed that there were some differences in the sources used by men and women (see **Appendix 59**). There were slight variations in the key sources of market information used by male and female farmers belonging to a farmers' group for the enterprise ranked priority number one (N=99) and two (N=94). Results obtained showed that male and female farmers mainly obtained market information from i) markets, followed by ii) neighbours. While cooperatives or factories were a major source for male farmers for the enterprises ranked priority number one, the data showed that very few female farmers obtained market information from cooperatives. The findings on market information for both enterprises showed that no female farmers obtained market information from the media. It was, however, observed that women used the media (radio) as a source of agricultural information on general agriculture (see **section 8.1.2**). Results from farmers not belonging to a group on sources of market and price information for the enterprises ranked priority number one and two used by male and female farmers corroborated the findings of farmers belonging to a group (see **Appendix 60**).

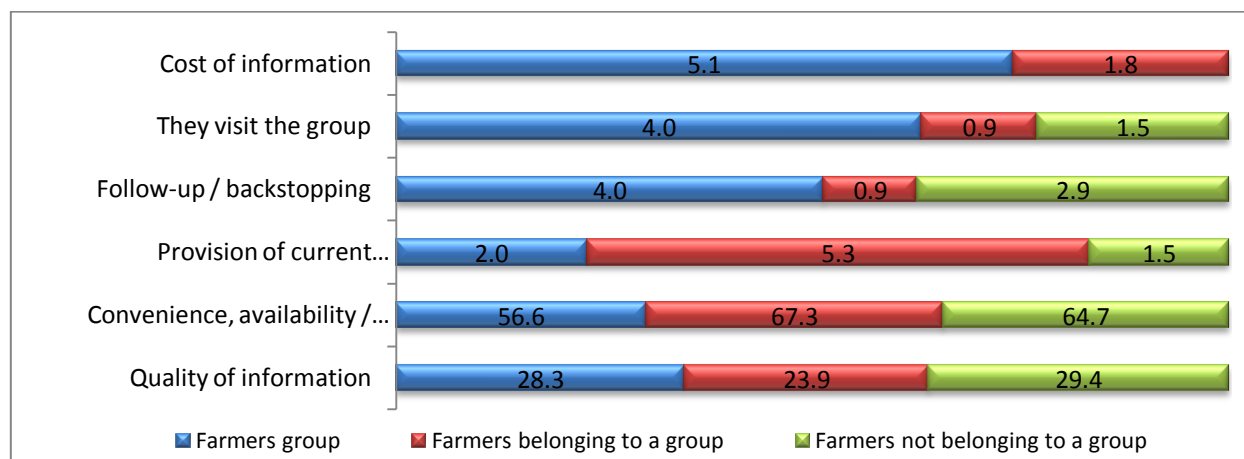
Although markets and neighbours emerged as the main sources of market information used by male and female farmers, there were some differences in the sources used by male and female farmers. The finding on cooperatives being a male dominated source for market information was consistent with that established by Tijani and Yano (2007:197) in Japan, who observed that despite the important role that women played in marketing, they were constrained and disempowered because most entry channels were through cooperatives, which were largely dominated by male farmers. Linked to the disempowerment of women in marketing, Barham and Chitemi (2009:57) in Tanzania confirmed that female only groups were more disadvantaged than the male only groups in terms of the marketing of the group's produce. They argued that groups with a higher male: female leadership ratio were more likely to access better markets. This finding implies that female leaders and female only groups were disadvantaged in terms of seeking marketing and price information for the groups and suggests a need to investigate the role of gender in seeking market and marketing information.

## **8.4 Criteria used to determine the main sources of advice, information and knowledge**

In identifying the main sources of agricultural and market information above, farmers used various criteria to determine which of the sources of information and knowledge or markets were most important.

### **8.4.1 General criteria used for determining the main sources of advice, information and knowledge**

**Figure 30** presents the criteria used by the three categories of farmers to determine the key sources of advice, information and knowledge.



**Figure 30: Criteria used by farmers in determining the main sources of information**

N=82 for farmers' groups, N=97 for farmers belonging to a group, N=65 for farmers not belonging to a group

There was conformity in the way in which farmers' groups (N=82), farmers belonging to a group (N=97), and farmers not belonging to a group (N=65) assessed the importance of sources. The results showed that most farmers took into consideration the availability of information providers, quality and timeliness of information, cost of information, mobility of the information provider and follow-up or backstopping.

- i) Availability of the information provider was a key criterion considered by the three categories of farmers. The proximity, availability and convenience of a source made it more attractive to farmers than those who were further away or not available.
- ii) The second criterion was the quality of information: farmers considered the qualifications of the provider in terms of their knowledge and technical competence. Focusing on the construct quality, farmers considered how comprehensive the information was, the relevance as well as the accuracy of the information.
- iii) The currency and timeliness of information: farmers often sought current information and rated the importance of a source based on how current the information was and how promptly the provider delivered the information needed.
- iv) The cost of information: farmers weighed various options such as whether the information provided was free or whether they had to pay for it, how much they had to pay, and whether they could afford the fee or not. Some sources were considered affordable while others were perceived to be too expensive. Sources belonging to the latter case were not considered to be important.
- v) Mobility of the information provider, and in particular whether the service provider visited farmers or groups, or whether farmers had to go out and look for the information providers in their offices to obtain information. Farmers generally attached more importance to sources

that visited them on their farms and tended to use such sources more frequently but they still sought experts regardless of their location whenever it was necessary.

- vi) The final criterion was whether the information provider backstopped the farmers or followed-up after the initial contact. Informants explained that some information providers came once and disappeared in “hit and run” visits, making the source unsustainable. They preferred long-term linkages where the provider would follow-through the farming activities from production right through to marketing.

The findings of the present study were consistent with Storer, Thunder and Murray-Prior's (2001), who used the criteria accuracy, ease of use, accessibility, timeliness, back-up and readability. On cost of information, Garforth *et al.* (2003:4) argued that although information may be seen as a public good accessible to all people, it may also be a merit good, which only a few recognised as valuable and purchased in the desirable amounts. This observation was earlier reported by Weiss, Van Crowder and Bernardi (2000:185), who found that farmers were paying for information where the expected returns appeared favourable. Similar findings were obtained by Zhao, Zhang and Klein (2009), who found that most dairy farmers in Mongolia (65%) were willing to pay for useful information, while 22% were not willing to pay, while 13% were non committal. In contrast, Hooton *et al.* (2006:546) showed that farmers in the dairy sector in Kenya were reluctant to pay for information services. Nevertheless, Van den Ban (1998:66) pointed out that free advice was often preferred to support operational decisions. In support of Garforth *et al.*'s (2003:4) argument about information being a public and merit good, the present study suggests the need to sensitise farmers to pay for comprehensive information services in order to reap the value of information. The criteria on follow-up was highlighted by Lewis (2008:300), who showed that although researchers were a key source of information used by farmers in Brazil, they did not follow-up on projects they initiated with farmers.

#### **8.4.2 Application of the criteria considered for determining the major sources of information and knowledge on specific sources used by farmers**

Farmers' groups and individual farmers used the criteria presented above to determine the main sources of information and knowledge. **Appendix 61** to **Appendix 63** summarise the application of the criteria on each of the sources of information and knowledge used by farmers' groups (N=82), farmers belonging to a group (N=97) and farmers not belonging to a group (N=65) respectively. A scrutiny of how farmers evaluated the top three sources (extension, the private sector and neighbours) showed that:

- i) Extension was considered to be a convenient and available source at location level. Informants had confidence in information from extensionists and perceived the source to be

reliable and comprehensive. Several informants commented on the high level and specialised training of extensionists, their technical expertise, knowledge and experience.

- ii) Private sector sources were perceived to be important sources because of their availability, proximity and specialised information asset. Most private sector actors visited farmers in their localities.
- iii) Neighbours were viewed as convenient because they were in the vicinity and were readily available for consultation. However, informants pointed out that while some neighbours were knowledgeable and ready to share information and knowledge, others were not willing to share. Still others were perceived to be less knowledgeable hence, their advice misled other farmers.

Although farmers' groups and group members were not among the three major sources of agricultural information and knowledge, they were considered a key source of information by farmers' groups.

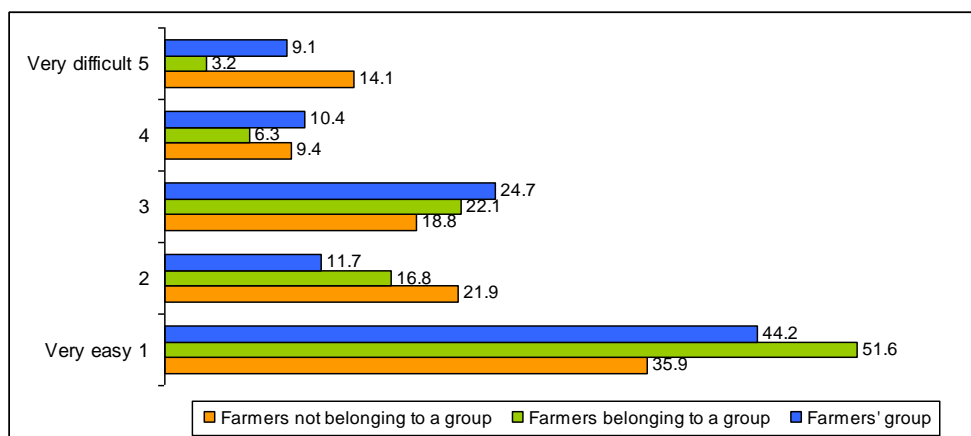
Farmers' groups were perceived to be convenient, available, knowledgeable and within the community. By virtue of being in groups, most farmers had received training on various farming activities, technologies and improved farming techniques, hence the information they shared was perceived to be of good quality and current. A few farmers not belonging to a group also considered farmers' groups to be an important source of information because most group members benefitted from several trainings.

## **8.5 Quality of information found from the main sources of agricultural information and knowledge**

Linked to the importance of sources of information and the criteria identified above in **section 8.4** is quality of information obtained from the main sources of information and knowledge. Quality of information and knowledge was assessed using the constructs ease of finding information, reliability, usefulness and relevance of the information and knowledge to the needs of farmers. Data for this section was collected through focus group discussions with farmers' groups and interviews with individual farmers.

### **8.5.1 Ease of finding information and knowledge from the main sources for the enterprise ranked priority number one**

Farmers' groups (N=77), farmers belonging to a group (N=95) and farmers not belonging (N=64) were asked to assess how easy it was for them to find information from the main sources of the enterprise ranked priority number one on a five point Likert scale, as depicted in **Figure 31**.



**Figure 31: Ease of finding information from main sources for the enterprise ranked priority number one**

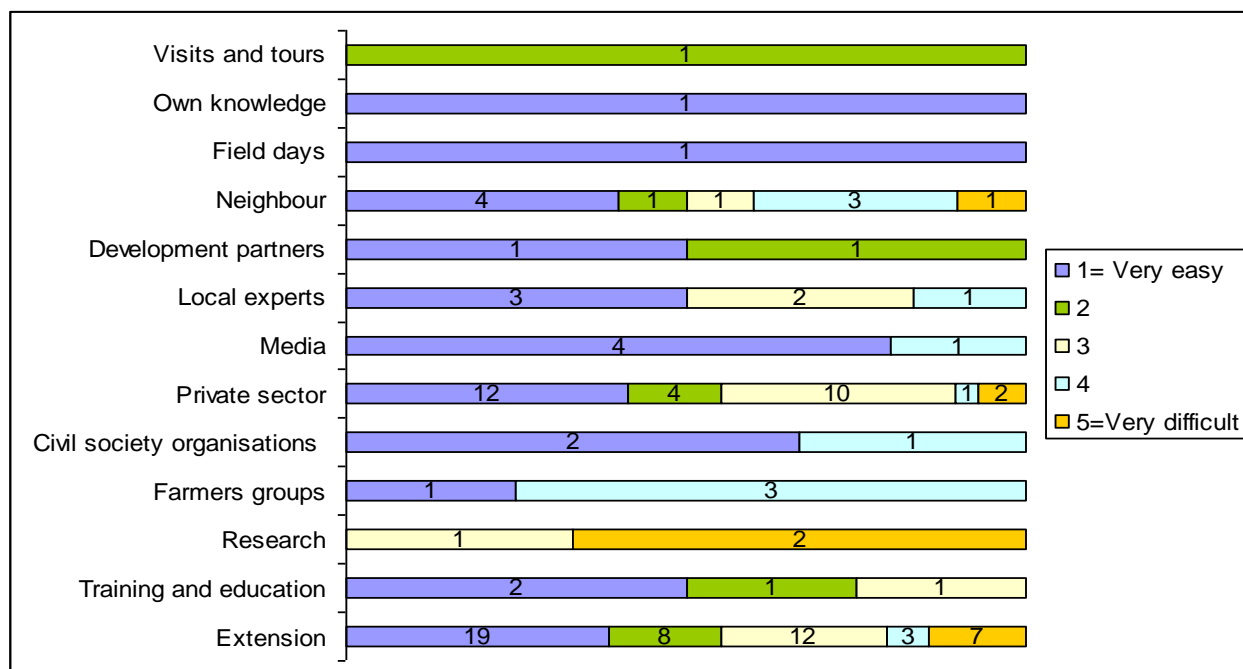
N=77 for farmers' groups, N=95 for farmers belonging to a group and N=64 for farmers not belonging to a group

#### 8.5.1.1 Farmers groups' perceptions on ease of finding information and knowledge from the main sources

Overall, 34 responses (44.2%) of the farmers' groups (N=77) found it very easy, 19 (24.7%) found it neither very easy nor very difficult, and 7 (9.1%) found it very difficult to find information from key sources for the enterprise ranked priority number one (see **Figure 31**).

**Figure 32** presents results of how easy it was for the groups to find information from specific sources of information and knowledge for the enterprise ranked priority number one. A significant 44.1% of the responses fell between scale three to five, suggesting that these farmers could not find information and knowledge with ease (see **Appendix 64**). Results for the top three sources that farmers' groups used showed that:

- i) Nineteen (19 responses, 38.8%) from the farmers' groups indicated that they found it very easy to find information from extension officers, 12 (24.5%) found it neither very easy nor very difficult, and 7 (14.3%) found it very difficult.
- ii) From the private sector sources, 12 (41.4%) found it very easy to find information, 10 (34.5%) as neither very easy nor very difficult, and 2 (6.9%) as very difficult.
- iii) Information from neighbours was perceived to be very easy to find by 4 informants (40%), as neither very easy nor very difficult and as very difficult by 1 (10%) each.



**Figure 32: Ease of finding information from specific sources for the enterprise ranked priority number one by farmers' groups**

N=77

Most farmers' groups found it difficult to find information from other farmers' groups. Results showed that only one farmers' group (25%) found it very easy to find information from other farmers' groups, while 3 (75%) found it difficult. Generally, farmers' groups found it very difficult to find information from research, while most groups found it very easy to find information from the media.

#### 8.5.1.2 Individual farmers' perceptions on ease of finding information and knowledge from the main sources

This section presents and interprets findings on the perceptions of individual farmers belonging and not belonging to a group on the ease of finding information and knowledge.

##### 8.5.1.2.1 Farmers belonging to a group

Slightly more than half (49, 51.6%) of the farmers belonging to a group (N=95) found it very easy to find information and knowledge from the main sources of information and knowledge for the enterprise ranked priority number one. Twenty one (21, 22.1%) found it neither very easy nor very difficult, while 3 (3.2%) found it very difficult (1, 1.6%) (see **Figure 31** above). Findings on the ease with which farmers belonging to a group found information from specific sources of information and knowledge were similar to those of farmers' groups. More than a third (79 of 213 responses, 37.1%) fell between scales three to five (neither very easy nor very difficult and very difficult), suggesting a need to improve access to some sources (see **Appendix 65**).

#### 8.5.1.2.2 Farmers not belonging to a group

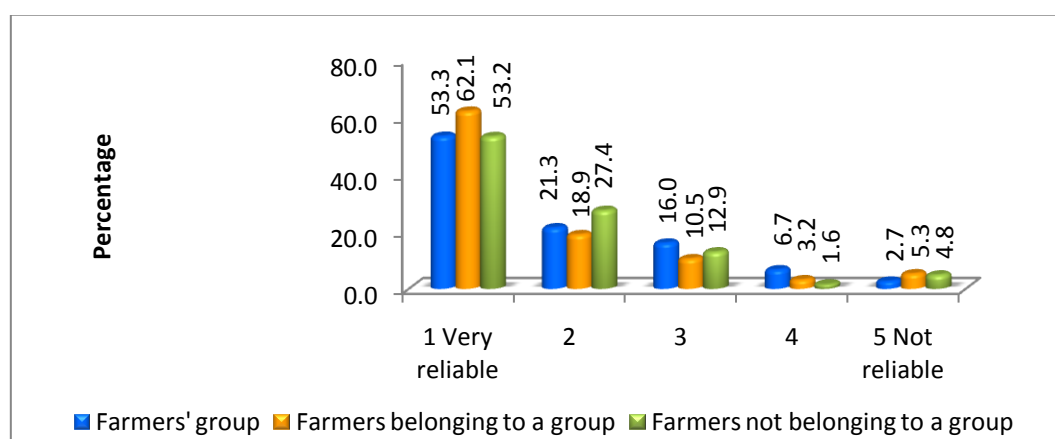
In general, 23 responses (35.9%) of the farmers not belonging to a group (N=64) found it very easy to find information for the enterprise ranked priority number one, 12 (18.8%) found it neither very easy nor very difficult, while 9 (14.1%) found it very difficult (see **Figure 31**). Findings on ease of finding information from specific sources were similar to those obtained for farmers belonging to a group and farmers' groups. More than two fifths (40.9%) of the responses of farmers not belonging to a group fell between scales three to five (see **Appendix 66**). The results for the enterprise ranked priority number two corroborated those obtained for the enterprise ranked number one.

#### 8.5.1.3 Comparison of ease of finding information and knowledge from the main sources by different categories of farmers

A comparison of the ease of finding information for the enterprise ranked priority number one by the three categories of farmers showed that there were more farmers belonging to a group (51.6%) who found it very easy to find information from the main sources for the enterprise ranked priority number one than farmers' groups (44.2%) and farmers not belonging (35.9%) respectively.

#### 8.5.2 Reliability of advice, information and knowledge from the main sources for the enterprise ranked priority number one

More than half of the informants perceived the information and knowledge obtained from the main sources of agricultural information and knowledge to be very reliable (see **Figure 33**).



**Figure 33: Reliability of the advice, information and knowledge from the main sources for the enterprise ranked priority number one by farmers**

N=75 for farmers' group, N=95 for farmers belonging to a group, and N=62 for farmers not belonging to a group

There were no significant differences in the way in which the three categories of informants perceived the reliability of these sources. However, more farmers belonging to a group considered the primary sources for the enterprise ranked priority number one to be very reliable than among the farmers' groups and farmers not belonging to a group categories (62.1% versus 53.3% and 53.2%). The findings on reliability of the main sources for advice, information and knowledge for the enterprise ranked priority number two corroborated those obtained for the enterprise ranked priority number one by farmers' groups, farmers belonging and those not belonging to a group.

#### **8.5.2.1 Farmers groups' perceptions on reliability of advice, information and knowledge from the main sources**

Overall, more than half (40 responses, 53.3%) the farmers' groups (N=75) perceived the information, advice and knowledge they obtained from their key sources for the enterprise ranked priority number one to be very reliable, while 12 (16%) perceived it to be neither very reliable nor not reliable, and 2 (2.7%) as not reliable (see **Figure 33** above).

**Appendix 67** summarises the perceived reliability of each of the main sources for advice, information and knowledge used by farmers' groups (N=75) for the enterprise ranked priority number one. A quarter of the responses (25.7%) fell between scales three and five, suggesting the need to improve the reliability of some sources of information and knowledge. Results on the three main sources showed that:

- i) Twenty eight (28 responses, 58.3%) indicated that they perceived information from extension to be very reliable, 6 (12.5%) as neither reliable nor not reliable, and 1 (2.1%) as not reliable.
- ii) Information from the private sector sources was considered to be very reliable (11, 39.3%), neither reliable nor not reliable (6, 21.4%), and not reliable (2, 7.1%).
- iii) Two (2, 25%) indicated that they viewed information from neighbours as very reliable and 1 (12.5%) as neither reliable nor not reliable.

One farmers' group (1, 25%) perceived information obtained from other groups and members as very reliable and 2 (50%) as neither very reliable nor not reliable (see **Appendix 67**).

#### **8.5.2.2 Individual farmers' perceptions on reliability of advice, information and knowledge from the main sources**

This section presents and interprets findings on the perceptions of farmers belonging and not belonging to a group on reliability of information, knowledge and advice from the main sources.



#### **8.5.2.2.1 Farmers belonging to a group**

The overall relative perceived reliability showed that about two-thirds (59 responses, 62.1%) of the farmers belonging to a group (N=95) perceived the information they obtained from key sources to be very reliable, 10 (10.5%) as neither very reliable nor not reliable and 5 (5.3%) as not reliable (see **Figure 33** above). Perceptions of farmers belonging to a group on the reliability of information and knowledge obtained from each specific source for the enterprise ranked priority number one resembled those obtained for farmers' groups (see **Appendix 70**). It was observed that 17.8% of the responses fell between scales three and five (neither very reliable nor not reliable, to not reliable). The results revealed that there were very few farmers belonging to a group who sought information from training and education institutions, research, CSOs, seminars, barazas and farmers' groups although most of those who obtained information from these sources perceived it to be very reliable. Findings on the reliability of information and knowledge obtained from the main sources for the enterprise ranked priority number two by farmers belonging to a group were consistent with those obtained for the enterprise ranked priority number one.

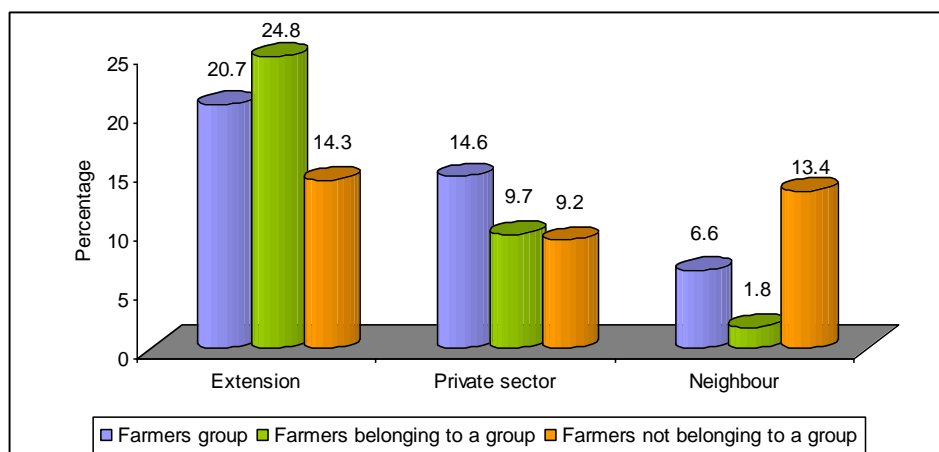
#### **8.5.2.2.2 Farmers not belonging to a group**

More than half (33, 53.2%) the farmers not belonging to a group (N=62) perceived the information and knowledge they obtained from the main sources for the enterprise ranked priority number one very reliable, 8 (12.9%) as neither reliable nor not reliable, and 3 (4.8%) as not reliable (see **Figure 33** above). Results on the reliability of information and knowledge obtained from each specific source for the enterprise ranked priority number one were similar to those obtained by farmers' groups and farmers belonging to a group, with 14.3% of the responses being between scale three and five (see **Appendix 69**). Findings on the reliability of the main sources for advice, information and knowledge for the enterprise ranked priority number two by farmers not belonging to a group (N=53) conformed with those obtained for enterprise one and those of farmers belonging to a group (see **Appendix 70**).

#### **8.5.2.3 Comparison of reliability of the top three sources of advice, information and knowledge by different categories of farmers**

**Figure 34** below shows that the percentages (total percentages) on the relative perceived reliability of information and knowledge from extension sources were higher for informants under farmers belonging to a group (24.8), than for farmers not belonging to a group (14.7%). This variation may be explained by the internal informal verification mechanisms of validating information through interactions. Farmers' groups recorded 14.6% on reliability of information obtained from the private sector, followed by farmers belonging to a group (9.7%) and lastly by farmers not belonging to a group (9.2%). Farmers not belonging to a group recorded the highest score for reliability of

information obtained from neighbours (13.4%), followed by farmers' groups (6.6%), then farmers belonging to a group (1.8%). The low percentage accorded by farmers belonging to a group to the reliability of information obtained from neighbours was likely to be because farmers belonging to a group relied more on support from their groups and members within the group, while farmers not belonging to a group did not have access to a supporting network.

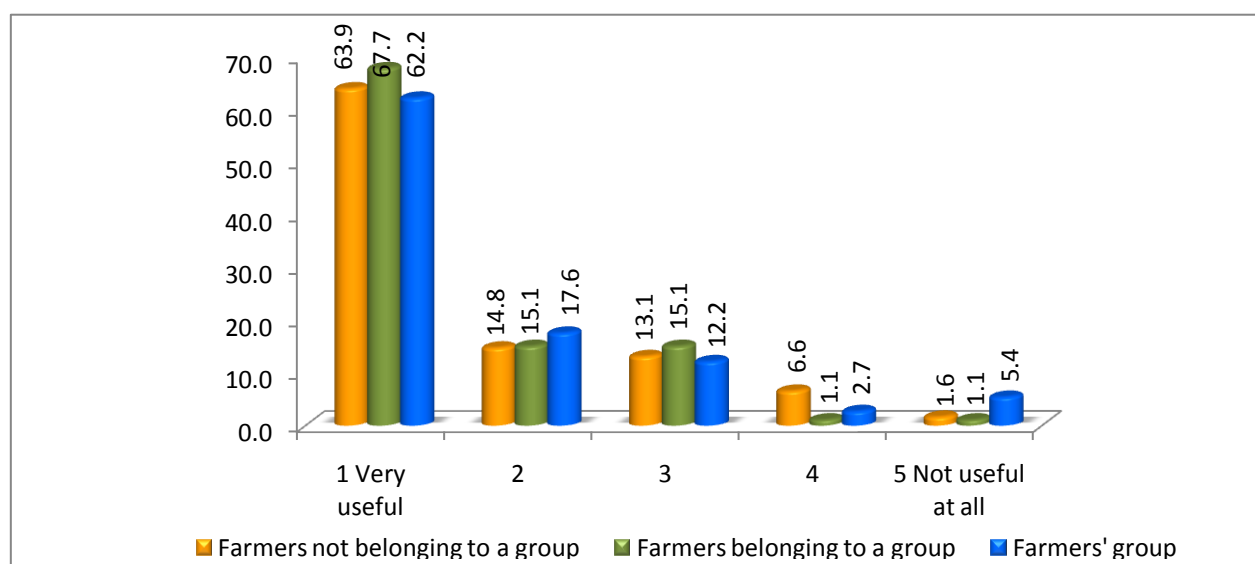


**Figure 34: Reliability of information and knowledge obtained from the top three very reliable sources for the enterprise ranked priority number one by small-scale farmers**

N=75 for farmers' groups, N=95 for farmers belonging to a group and N=62 for farmers not belonging to a group

### 8.5.3 Usefulness of the main sources of advice, information and knowledge for the enterprise ranked priority number one by farmers' groups

In the context of the present study, usefulness of information referred to how helpful the information was to the farming activities of small-scale farmers. Individual farmers and farmers' groups were asked to indicate how useful they found information, advice, or knowledge they obtained from the major sources they used on a Likert scale of one to five. **Figure 35** summarises results of the perceived usefulness of information and knowledge for the enterprise ranked priority number one by the different categories of farmers.



**Figure 35: Usefulness of information and knowledge from the main sources for enterprises ranked priority number one**

N=74 farmers' groups, N=93 farmers belonging to a group and N=61 farmers not belonging to a group

#### 8.5.3.1 Farmers groups' perceptions on usefulness of advice, information and knowledge from the main sources

Results showed that 46 responses (62.2%) of the farmers' groups (N=74) perceived the information obtained from the main sources for the enterprise ranked priority number one to be very useful, 2 (2.7%) as neither very useful nor not useful at all, and 4 (5.4%) as not useful at all. Eighteen (18%) of the responses on usefulness lay between scales three to five (see **Figure 35**). **Appendix 71** presents findings on usefulness of information from each specific source used by farmers' groups for the enterprise ranked priority number one. Findings on the usefulness of information from the top three sources (extension, the private sector and neighbours) revealed that:

- i) Thirty four responses (34, 72.3%) perceived information from extension services to be very useful, 4 (8.5%) as neither very useful nor not useful at all, and 3 (6.4%) as not useful at all.
- ii) Fifteen (15, 55.6%) viewed information from the private sector as very useful, 1 (3.7%) each as neither very useful nor not useful at all, and not useful at all.
- iii) Four (4, 50%) considered information from neighbours very useful and 2 (25%) as neither very useful nor not useful at all. No one perceived neighbours as not useful at all.

Only one (1, 25%) group perceived information obtained from other farmers' groups as very useful and 3 (75%) as neither very useful nor not useful at all. There were no informants who considered farmers' groups as not useful at all. Information and knowledge for the enterprise ranked priority

number one by farmers' groups from research, civil society, media, local experts, development partners, field days and tours was perceived to be very useful and useful. Eighteen (18%) of the responses fell within scale three (neither very useful nor not useful at all) and five (not useful at all) (see **Appendix 71**).

#### **8.5.3.2 Individual farmers' perceptions on usefulness of advice, information and knowledge from the main sources**

This section presents and interprets findings on the perceptions of farmers belonging and not belonging to a group on the usefulness of information, knowledge and advice from main sources.

##### **8.5.3.2.1 Farmers belonging to a group**

Two thirds (63, 67.7%) of the farmers belonging to a group (N=93) ranked the usefulness of the information, advice or knowledge they obtained from key sources for the enterprise ranked priority number one as very useful, 14 (15.1%) as neither very useful nor not useful at all and 1 (1.1%) as not useful at all (see **Figure 35** above). **Appendix 72** presents an analysis of the usefulness of information and knowledge from specific sources for the enterprise ranked priority number one and how farmers belonging to a group perceived their usefulness. Overall, most of the informants perceived the key sources of information and knowledge to be very useful and useful. A significant 17.9% of the responses fell between scales three and five (neither very useful nor not useful, and not useful at all). Findings on the usefulness of information and knowledge from the top three sources of information and knowledge for the enterprise ranked priority number one showed that:

- i) Most informants (46, 76.7%) perceived the information from extension services very useful, while 6 (10%) considered it as neither very useful nor not useful at all, and 1 (1.7%) as not useful at all.
- ii) Private sector information was considered very useful by 32 (74.4%), as neither very useful nor not useful at all by 7 (16.3%) and as not useful at all by 1 (2.3%).
- iii) More than half (16, 51.6%) the farmers belonging to a group considered information obtained from neighbours very useful and 8 (25.8%) as neither very useful nor not useful at all. There were no informants that viewed neighbours as not useful at all.

Six (6, 50%) farmers belonging to a group viewed information obtained from farmers' groups very useful and a third (4, 33.3%) as neither very useful nor not useful. No informant perceived farmers' groups as not useful at all. Other useful sources included media (mainly radio) and CSOs (see **Appendix 72**). Results on the usefulness of the main sources of advice, information and knowledge for the enterprise ranked priority number two by individual farmers belonging to a group corroborated the findings obtained for the enterprise ranked priority number one.

#### **8.5.3.2.2 Farmers not belonging to a group**

Thirty nine (39 responses, 63.9%) of the farmers not belonging to a group (N=64) considered the information and knowledge they obtained from key sources for the enterprise ranked priority number one to be very useful, 8 (13.1%) perceived the information to be neither very useful nor not useful and 1 (1.6%) as not useful (see **Figure 35** above). **Appendix 73** presents findings on the usefulness of specific sources of advice, information and knowledge for the enterprise ranked priority number one by farmers not belonging to a group. Some 15.6% of the responses fell within scale three and five (neither very useful nor not useful, and not useful at all), suggesting that most of the sources were useful. Results for the three main sources of information and knowledge for the enterprise ranked priority number one by farmers not belonging to a group showed that:

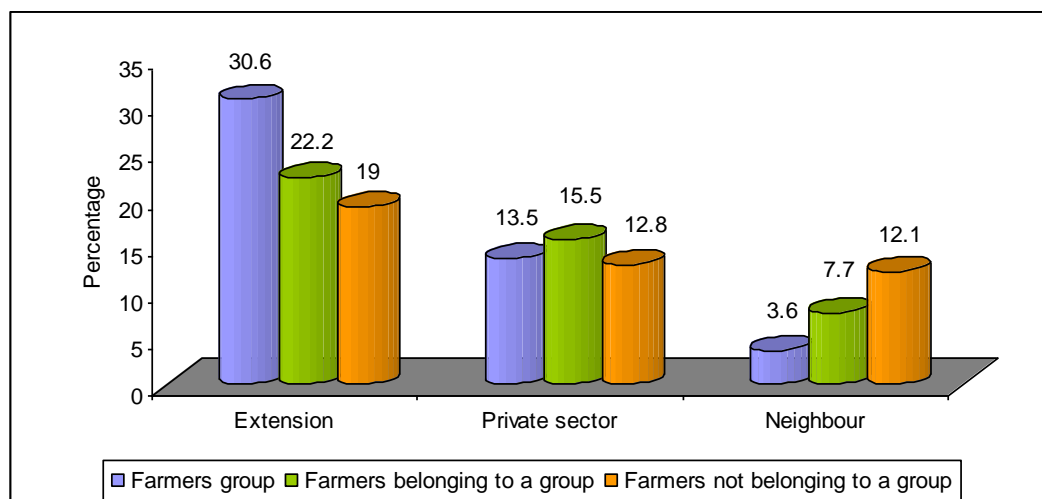
- i) Twenty two (22, 73.3%) responses perceived that information from extension services was very useful, 1 (3.3%) as neither very useful nor not useful at all, while nobody considered information obtained from extension as not useful.
- ii) Information and knowledge from neighbours was viewed as very useful by 15 (53.6%), as neither very useful nor not useful at all by 5 (17.9%), and as not useful at all by 1 (3.6%).
- iii) Information and knowledge obtained from the private sector was perceived to be very useful by 14 (63.6%), as neither very useful nor not useful by 3 (13.6%) and no one considered the source as not useful.

Only one informant ranked the usefulness of information obtained from farmers' groups. This informant perceived the information obtained to be very useful. Information from sources such as research, training and information, CSOs, seminars, barazas and farmers' groups was perceived to be very useful (see **Appendix 73**).

#### **8.5.3.3 Comparison of the usefulness of advice, information and knowledge obtained from the main sources by different categories of farmers**

A comparison of the rankings of the usefulness of information and knowledge used by farmers' groups, farmers belonging to a group and farmers not belonging to a group demonstrated that there were no significant differences in the order in which the three categories of farmers ranked the usefulness of the top three sources. However, the percentages (total percentages) varied between categories, with farmers' groups recording the highest levels on usefulness of extension (30.6%), followed by farmers belonging to a group (22.2%) then farmers not belonging to a group (19%). In the case of the private sector, farmers belonging to a farmers' group recorded the highest score (15.5%), followed by farmers' group (13.5%), then farmers not belonging to a group (12.8%). The figures for neighbours were highest for farmers not belonging to a group (12.1%), followed by farmers belonging to a group (7.7%), then farmers' groups (3.6%). The results suggest that farmers' groups did not perceive the information from neighbours to be as useful as individual farmers did (see **Figure**

36). The findings on the usefulness of advice, information and knowledge obtained from main sources for the enterprise ranked priority number two corroborated those obtained for the enterprise ranked priority number one.

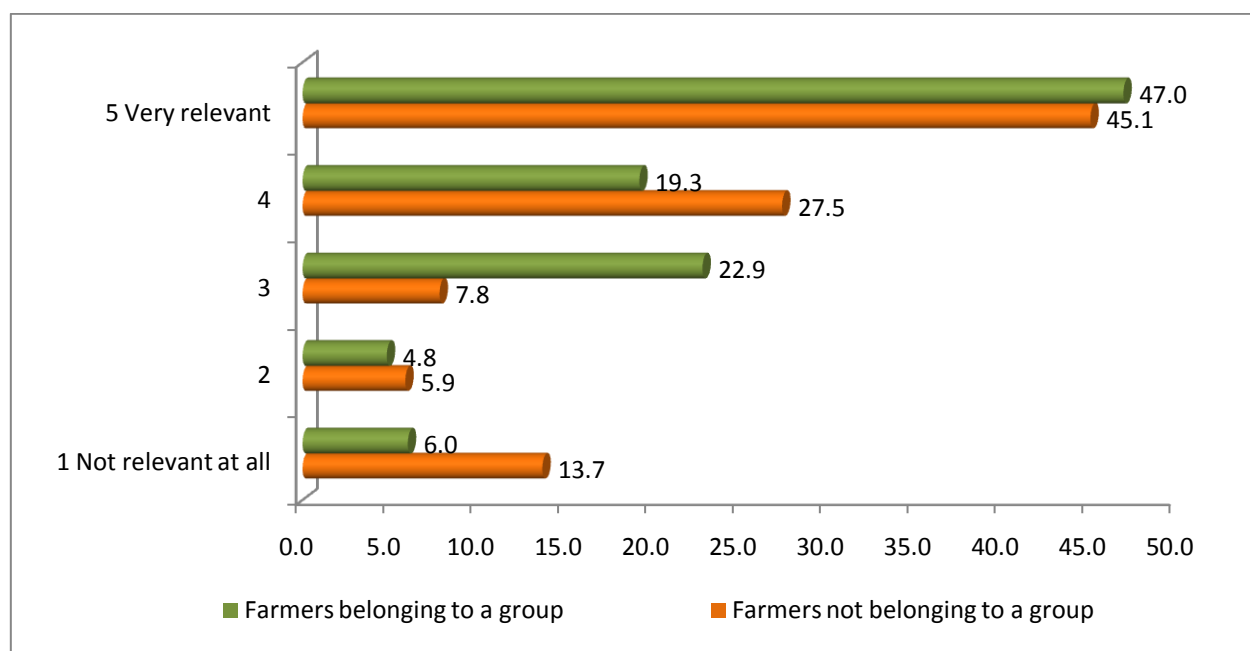


**Figure 36: Analysis of the usefulness of the top three sources of advice, information and knowledge for the enterprise ranked number one**

N=74 farmers' groups, N=93 farmers belonging to a group and N=64 farmers not belonging to a group

#### 8.5.4 Relevance of advice, information and knowledge accessed from main sources to the needs of farmers

The relevance of information determines whether that piece of information meets the needs of small-scale farmers or not. **Figure 37** portrays the extent to which farmers perceived the information and knowledge they obtain from the main sources for their needs for the enterprises ranked priority number one for farmers groups and two for individual farmers.



**Figure 37: Relevance of information, advice and knowledge for enterprise ranked priority number two to the needs of individual farmers**

N=83 for farmers belonging to a group, and N=51 for farmers not belonging to a group

#### **8.5.4.1 Farmers groups' perceptions on the relevance of advice, information and knowledge to their needs for the enterprise ranked priority number one**

Almost three fifths (43, 59.7%) of the farmers' groups (N=72) perceived the information they obtained from the main sources for the enterprise ranked priority number one to be very relevant to their needs, 12 (16.7%) as neither very relevant nor not relevant at all, 10 (13.9%) as neither very relevant nor not relevant at all, 2 (2.8%) as slightly relevant and 5 (6.9%) as not relevant at all.

**Appendix 74** summarises findings on the perceived relevance of information and knowledge obtained from the specific sources for the enterprise ranked priority number one by farmers' groups. Almost a quarter of the responses (24.1%) fell between scale three and five (neither very relevant nor not relevant), indicating the need for better targeting of information to the needs of farmers. Results on relevance of information obtained from the three key sources for the enterprise ranked priority number one by farmers' groups showed that:

- i) More than two thirds (32 responses, 69.6%) of the farmers' groups perceived information obtained from extension services to be very relevant to their needs, 4 (8.7%) as neither very relevant nor not relevant, and 2 (4.3%) as not relevant to the needs of farmers' groups.
- ii) Half the groups (13, 50%) found information obtained from the private sector to be very relevant to their needs, 1 (3.8%) as neither very relevant nor not relevant, and 3 (11.5%) as not relevant at all to their needs.

- iii) Information obtained from neighbours was perceived to be very relevant and as neither very relevant nor not relevant (3, 37.5% each). It was observed that there were no informants who perceived information from neighbours as not relevant or not relevant at all to their needs.

One farmers' group (1, 25%) considered information obtained from other farmers' groups and group members to be very relevant to their needs for the enterprise ranked priority number one and 3 (75%) as neither very relevant nor not relevant at all. There were no informants who viewed information from farmers' groups as not relevant or not relevant at all (see **Appendix 74**).

#### **8.5.4.2 Individual farmers' perceptions on the relevance of advice, information and knowledge for the enterprise ranked priority number two**

This section presents results and discusses findings on the perceptions of farmers belonging and not belonging to a group on the relevance of information, knowledge and advice for the enterprise ranked priority number two.

##### **8.5.4.2.1 Farmers belonging to a group**

Farmers belonging to a group (N=83) had varying perceptions on how relevant the information and knowledge they obtained from the main sources was to their needs for the enterprise ranked priority number two. Thirty nine (39, 47%) considered the information and knowledge to be very relevant, 19 (22.9%) as neither very relevant nor not relevant, and five (5, 6%) as not relevant at all (see **Figure 37** above). **Appendix 75** presents findings on how farmers belonging to a group (N=83) perceived the relevance of the primary sources for the enterprise ranked priority number two. A significant 34.9% indicated that the information and knowledge was between scales three and five (neither very relevant nor not relevant at all and not relevant at all), suggesting the need to improve the relevance of information. Results of the top three sources showed that:

- i) Twenty nine (29, 67.4%) farmers belonging to a farmers' group found the information obtained from the private sector to be very relevant to their needs, five (5, 11.6%) as neither relevant nor not relevant, and none as not relevant at all.
- ii) Twenty eight (28, 71.8%) found information from extension services to be very relevant to their needs, 4 (10.3%) as neither very relevant nor not relevant and 1 (2.6%) as not relevant at all to the needs of farmers belonging to a group.
- iii) Fourteen (14, 9.2%) farmers belonging to a group perceived the information from neighbours to be very relevant, 11 (7.2%) as neither relevant nor not relevant and 1 (0.7%) as not relevant at all.



Farmers' groups were perceived to be very relevant by one farmer belonging to a group (1, 20%), as neither very relevant nor not relevant at all by 2 (40%), and as not relevant at all by 1 informant each (20%) (see **Appendix 75**).

#### **8.5.4.2.2 Farmers not belonging to a group**

**Figure 37** above shows that 23 (45.1%) farmers not belonging to a farmers' group (N=51) perceived the information obtained from the key sources for the enterprise ranked priority number two to be very relevant to their needs, 4 (7.8%) as neither very relevant nor not relevant at all, and 7 (13.7%) as not relevant at all. **Appendix 76** depicts the perceptions of farmers not belonging to a group (N=51) on the relevance of each of the main sources for the enterprise ranked priority number two. A significant 23.6% of the informants ranked the relevance of information available to them to be between scale three and five (neither very relevant nor not relevant at all to their needs), suggesting a need to align the information provided to the needs of farmers. Results obtained for the three main sources showed that:

- i) Twelve (12, 48%) informants found information from extension services to be very relevant to their needs, 1 (4%) as neither very relevant nor not relevant at all and 4 (16%) as not relevant at all.
- ii) Eight (8, 47.1%) informants perceived the information from neighbours to be very relevant, 2 (11.8 %) as neither very relevant nor not relevant at all and none as not relevant at all.
- iii) Seven (7, 43.8%) farmers not belonging to a farmers' group perceived the information they obtained from the private sector to be very relevant to their needs, 2 (12.5%) as neither very relevant nor not relevant at all, and 3 (18.8%) as not relevant at all.

Information and knowledge from farmers' groups and group members was perceived to be very relevant by one informant (see **Appendix 76**).

#### **8.5.4.3 Comparison of the relevance of advice, information and knowledge obtained from the main sources by different categories of farmers**

The data presented for farmers' groups was for the enterprise ranked priority number one, while that for individual farmers was for the enterprise ranked priority number two. As such, the two sets cannot be compared. With regard to individual farmers, there was no significant difference between farmers belonging and not belonging to a group who perceived the advice, information and knowledge to be very relevant to their needs. However, there were more farmers not belonging to a group than farmers belonging to a group who perceived the information as not relevant at all (13.7% versus 6%). Likewise, there were more farmers belonging than not belonging to a group who considered the advice, information and knowledge from extension (71.8% versus 48%) and the private sector (67.4% versus 43.8%) to be very relevant to their needs. Relatively more farmers not

belonging than belonging to a group found information from neighbours to be very relevant to their needs (47.1% versus 9.2%).

Llewellyn (2007:149) affirmed that quality information reduced uncertainties and the risk of making decisions that may not be right. As pointed out in **section 4.7.2**, users considered different variables in assessing the quality of information. The findings of the present study showed that small-scale farmers had varying perceptions on the ease of finding information and knowledge obtained from key sources as well as its reliability, usefulness and relevance. With regard to the ease of finding information, the findings of the present study showed that less than half the farmers' groups, about half the farmers belonging to a group, and about a third of the farmers not belonging to a group found it very easy to access agricultural information from major sources. The finding on most farmers' groups finding it difficult to access information from other groups was surprising, considering that groups were perceived to be change agents in rural communities. More than one third of the groups ranked the variable ease of accessing information and knowledge between average (neither very difficult nor very easy) and very difficult. By comparison, the findings by Kiondo (1998:219) showed that most rural women had limited access to information. Stefano's (2004) study showed that farmers used information that was relevant, easy to access and understand. Linked to ease of accessing information, Oyedele and Yahaya (2009:173) found that farmers in Nigeria preferred to use information from extension officers and radio because of their accessibility.

The finding on ease of accessing information and knowledge showed that more farmers belonging than not belonging to a group found it very easy to find information from the main sources. A plausible explanation may be because groups had easier access to information providers and training opportunities since most service providers worked with group. Farmers belonging to a group thus interacted with different actors and other farmers hence were more aware of what information was available and how to access it. Through interactions with each other, farmers also learned how to find information. As pointed out by Stefano *et al.* (2005b:64), awareness of the existing AKIS influenced use of information. The present study showed that use of market information was low because farmers did not know how to access the SMS service (see **section 9.4.3.2**). Kinengyere (2007:339-340) established that usage of information and knowledge was low where users did not know how to utilise the available resources. These findings imply that there was low information literacy among small-scale farmers and suggest the need for training users to improve their existing capacity to find and use information. The finding that individual group members considered it easier to find information than did a group was consistent with the findings on individual versus group decision making (see **section 10.3**), which showed that the process of decision making within groups was more difficult and took much longer.

Reliability of information was closely linked to trustworthiness (Salaün and Flores 2001:27). The study findings showed that more than half of the informants perceived the information and knowledge obtained from extension, the private sector, neighbours, farmers' groups and other major sources to be very reliable. Farmers considered information from extension services to be authoritative, reliable and comprehensive, followed by information from the private sector sources. As established by Nyambo *et al.* (2009:100), the private sector in Kenya was providing complementary extension services to farmers. Information obtained from neighbours was perceived to be the least reliable among the top three sources. Of the three categories of farmers, information from neighbours received the highest score from farmers not belonging to a group and the lowest score from farmers belonging to a group. Farmers belonging to a group possibly relied more on support from group members. Farmers not belonging to a group did not have a network of peers to interact with hence relied on other farmers and neighbours.

On usefulness, most informants perceived the information they obtained to be between the scales very useful and useful. Zhao, Zhang and Klein (2009) found that fewer farmers in Mongolia perceived information they obtained to be very useful (14% in Mongolia versus 62.2% farmers groups, 50% farmers belonging to a group and 63.9% of the farmers not belonging to a group established by the present study), 20% as useful, 32% as not very useful and 34% as useless. These findings imply that information obtained by farmers in Kirinyaga district from key sources was more useful to the needs of farmers than their Mongolian peers.

Relevance was another key factor for determining the quality of information (Bokhari 2005). Relevance of information relates to meeting the needs of the user quickly and accurately (Salaün and Flores 2002:27). Buchanan-Smith, Davis and Petty (1994:69) pointed out that some of the existing information systems were not being used adequately because of issues of access to the information, who controlled it, who owned it and credibility of the information. The study findings showed that less than half the farmers perceived the information from key sources as very relevant, but more than 66% farmers belonging to a group and 72% farmers not belonging to a group considered the information and knowledge to be between relevant and very relevant. Linked to the perceptions on relevance by farmers, in Tanzania, Kiondo (1998:222) found that information providers perceived the information they delivered to rural women to be moderately relevant to their needs. The present study showed that generally, farmers perceived the information obtained from extension and the private sector to be very relevant. Although the present study showed that farmers perceived information they obtained from neighbours and other farmers to be of low relevance, Rees *et al.* (2000:10) and Stevens (2007:303) observed that other farmers were important and relevant sources of information and knowledge. For example, Stevens (2007:303) found that 84% of the irrigation farmers in South Africa relied on other farmers for information. This finding implies that there was a

need to educate farmers on new technologies and modern farming methods to improve the relevance of information they shared with other farmers and neighbours.

On information from other farmers' groups, the study findings showed that 25% farmers' groups, 20% farmers belonging to a group and 100% farmers not belonging to a group perceived information obtained from other farmers' groups and group members to be very relevant to their needs. This finding was similar to Llewellyn's (2007:152), who established that farmers in Australia perceived information from farmers' groups to be important because it was relevant to their needs. In some cases, the group was the only available source in the vicinity. In summary, information reaches farmers from diverse sources and good quality information is a prerequisite for establishing strong linkages, a good relationship and trust between farmers and information providers. These findings suggest a need to improve the quality of agricultural information provided to small-scale farmers, by improving access, ensuring the content provided was accurate, factual, comprehensive and targeted to the needs of farmers to help improve relevance, reliability and usefulness of information.

## **8.6 Users of agricultural knowledge and information**

This section answered the **research question 2.2: *Who uses the agricultural knowledge and information of the information providers?*** In the context of the present study, users were defined as individuals, groups, institutions and networks with special agricultural-related needs, which used information and knowledge available in the AKIS. Data for this section was collected through questionnaires, interviews with farmers, and representatives of GoK, research, training and education institutions, NGOs, CBOs and projects, key informants, input stockists and through observation. Users were classified into broad groupings. However, it was observed that each category did not have uniform information needs and seeking behaviours.

The main categories of users identified by the study were: i) Small-scale farmers or producers, who were the key users of information and knowledge in the system and comprised farmers' groups, farmers belonging to a group and those not belonging to a group. Farmers' groups were further classified into male only groups, female only groups, youth only groups and mixed groups. Another sub-category of users was school children, specifically 4-K and environment clubs in primary schools, and environment clubs and Young Farmers Clubs in secondary schools (see **sections 6.3.1 and 8.8.1**). ii) There were various agricultural related committees and groups such as the FADC and "Community parliament" representatives that fell in the category of producers (see **sections 9.3.5 and 9.3.6**). iii) Extensionists from the Ministry of Agriculture and the Ministry of Livestock Development, other government departments and parastatals including the Ministry of Fisheries, Forestry Department, Ministry of Cooperatives, Ministry of Water and Ministry of Gender, Children and Social Services, HCDA, the National Cereals and Produce Board (NCPB) and the NIB. There

were also private extension service providers facilitated by KTDA, horticultural exporting companies, NGOs, CBOs, and development partners that used agricultural information and knowledge in the AKIS. iv) Researchers from various national institutions namely KARI, CRF, TRF, Mwea Irrigation Agriculture Development Centre (MIAD) and international institutions such as the ICIPE, the ICRAF and ILRI. v) The private sector users included agrovets, representatives of credit and microfinance institutions for example the Agricultural Finance Corporation (AFC), SACCOs and banks, input suppliers including seed companies, agrochemical companies, animal feed suppliers, hatcheries, agro-processors, horticultural and exporting companies, as well as transporters and marketers, Global GAP, traders and brokers. vi) Educators and trainers from Jomo Kenyatta University of Agriculture and Technology (JKUAT), University of Nairobi and KATC, as well as scholars from various education institutions. vii) Among the users from CSOs were staff working with farming communities in Kirinyaga district, including NGOs, CBOs, projects, religious organisations and churches. viii) Policy makers and planners. ix) Project staff of development partners such as USAID, GTZ, Sida and EU that worked with local communities in Kirinyaga. x) Visitors from other districts and from abroad.

The study findings confirmed those of other authors (Aina 1995:1; Thompson 1998), that there were diverse users of the agricultural information and knowledge of information producers in rural areas. Aina (1995:1) identified the following categories of users: farmers, policy makers and planners, researchers, extensionists, educators and agro-processors, while Thompson (1998) distinguished cooperatives, farmers, researchers, agribusiness, government organisations, young farmers and students. Findings of the present study confirmed Aina's (1995:1) assertion that all categories of users need information because it is critical to development.

### **8.7 The agricultural knowledge and information system (AKIS) of small-scale farmers**

This section answered the **research question 2.3: *What AKISs (relevant to small-scale farmers) are present in the district?*** What are the key features of the system(s)? The section presents and interprets findings on the AKISs of small-scale farmers in Kirinyaga district. The concept of AKIS was discussed in detail in **section 4.1**. Data was collected using checklists of key actors, RAAKS windows, observation and PRA methods. Supplementary data was collected through interviews with farmers, GoK institutions, research and education institutions, NGOs, CBOs, projects and religious organisations and key informants, as well as focus group discussions with farmers' groups, questionnaires with information providers and observation.

The findings of the study showed that there were many actors who were active and relevant to the AKIS of small-scale farmers in Kirinyaga district (see **Appendix 77**). **Section 9.1** presents the key actors in Kirinyaga district, and provides details on why each actor was considered to be a key actor

or not, and the role that each played in the system. The key actors were classified under six main sub-systems namely i) small-scale farmers, ii) input suppliers, iii) researchers, iv) extension, training and education, v) credit and vi) marketing.

**Figure 38** below presents a snap shot of the basic configurations (RAAKS) of the AKIS of Kirinyaga district and ties together all the data collected through the triangulated methods. Although the basic configuration depicts the AKIS of the whole district, there were variations between divisions, locations and sub-locations. For example, in Mwea division the AKIS of the lowlands where irrigation is widely practiced and rice, cotton and horticultural crops were the main crops grown contrasted sharply with those of the highland areas of Gichugu, Central and Ndia divisions. Even within a division such as Mwea, there were different agroecological zones and different enterprises were produced in different locations and sub-locations. Likewise, Central, Gichugu and Ndia divisions had variations although they shared similar agroecological conditions (see **section 2.3.1.1**). The AKIS of an area was also determined by the objectives of the farmers or groups (see **section 6.3**), the core enterprises produced (see **section 6.5**), and the actors who were on the ground. As depicted in the basic configuration diagram (see **Figure 38**), some of the actors carried out research, training and offered marketing services. Others provided inputs and credit, while some performed multiple roles as presented in more detail in Chapter nine.

Various types of linkages connected the different components of the AKIS including regular linkages, weak linkages and soft boundary linkages. The regular linkages showed the relationships between actors who worked and interacted with each other regularly. While some linkages with actors were strong (depicted as a straight line below), others were weak and irregular (denoted by the broken lines below<sup>73</sup>). There were also soft boundaries, which were virtual and knitted the actors under the different sub-systems together into a “whole” system (see **Figure 38**). The soft boundary linkages aimed at delivering value to users of the AKIS and depicted an ideal situation, where synergistic effects are realised through linkages between key actors in addressing specific agricultural problems or improving specific aspects. However, there were very few examples that depicted the “wholeness” of the system, and actors within each sub-system such as the input, research, education, training and extension, mainly worked independently and in some cases in competition with each other. For example, seed suppliers worked independently from agrochemical suppliers and extension. In most cases, the research components carried out by the universities, NGOs, the private sector and national research centres worked independently of one another.

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<sup>73</sup> Different colours have been used for clarity to show the soft boundaries under the different sub-sectors. Actors that provide multiple services such as MIAD, which plays an active role under research and as input suppliers have been indicated under both sub-sectors in red to simplify the diagram and for emphasis.



The study showed that the AKIS of Kirinyaga district comprising small-scale farmers; input; research; education, training and extension; credit and microfinance; and marketing sub-systems that were interwoven through regular and weak linkages and soft boundaries. Regular linkages show the relationships between actors, how they communicate knowledge, information and other resources as well as how they work together (Salomon and Engel 1997a:19). The Systems approach and Soft systems perspectives (Checkland 1988:309; Checkland and Scholes 1990; Senge 2006:7,42,73) (see **section 3.2.1**) provided a lens for viewing and understanding and describing the AKIS of Kirinyaga district. As pointed out by Checkland (1988:304-309) and Engel (1997:24), this approach provides a perspective for viewing the different virtual sub-systems of actors that were interacting as an entity with “emergent properties,” which were only meaningful at the larger system level. The system’s level provided the necessary “holistic approach” to solving complex issues of farmers (Röling and Wagemakers 1998:16). As noted by Fisk, Hesterman and Thorburn (1998:218), community members do not exist in isolation, but rather, are enmeshed in the fabric of society and culture from which they come. They pointed out that solutions to complex social problems emerged from community members. Systems thinking helped to see “wholes,” organise patterns, and interrelationships. The social actors were linked together into a virtual system that showed how the actors created, adapted, shared, stored and applied knowledge and information (Salomon and Engel 1997a; Röling and Jiggins 1998:304). The system comprised human beings and information, but because it is virtual and not a reality, it is referred to as a soft system (Nakamori 2006:12).

The present study’s findings demonstrate that the AKIS of small-scale farmers was complex and location specific. There were diverse actors providing agricultural knowledge and information to small-scale farmers comprising individuals, groups and institutions that played complementary roles in the AKIS of Kirinyaga district at the time the study was conducted. The basic configuration diagram (see **Figure 38**) shows the sense made of the field work by the researcher using multiple methods to study the AKIS of Kirinyaga, the key actors, how they are organised under the respective sub-systems, and how they link to other actors. Each actor worked towards increasing the agricultural productivity of small-scale farmers, but most worked independently and directly with the farmers. These findings corroborated those of other authors in Kenya (Den Biggelaar and Mugo 1996; Rees *et al.* 2000; Karanja and Ouma 2006), Africa (Garforth 2001a; Stefano *et al.* 2005b; Worth 2006) and other parts of the world (Röling 1988; Engel 1997:40; Bachmann 2000; Rivera, Qamar and Mwandemere 2005:11) (see **section 4.7.3**).

Like earlier studies, the present study showed that linking this number of actors from different sectors and with different objectives and interests into a whole was complex, and most linkages between actors were weak and irregular (see **Chapter nine**). Each actor had his/her own motives and interests, some of which were conflicting (Munyua and Stilwell 2010:15). The limited collaboration

between actors suggests the need for mechanisms to foster collaboration among actors in order to benefit from each other's strengths. The various agricultural actors also needed to realise their complementary roles in order to achieve a synergistic outcome in bringing agricultural development to Kirinyaga district. The finding on AKISs being location specific were consistent with findings of earlier authors, who showed that AKISs were localised and depended on agroecological zones, enterprises as well as social, economic, technological and regulatory parameters of its users (Asopa and Beye 1997b; Andima *et al.* 1999; Rees *et al.* 2000; Davis 2004:195).

The different functions or sub-systems or objectives such as research or input suppliers or credit suppliers were virtually linked through the soft boundaries (Salomon and Engel 1997a:19,20) (see **Figure 38**). The soft boundaries were based on the social constructivist paradigm and the soft systems thinking and highlighted the idealistic interrelationships (Röling 1992) between actors that would improve the flow of knowledge and information. There is, however, a need for concerted action by multiple actors to realise synergy in a “theatre of innovation” (Röling 2004:3). This need was confirmed by Rivera, Qamar and Mwandemere (2005:52-53) in their study of AKIS in ten countries, which established the need for public collaborative research between the mainstream research institutions and other actors including farmers, policy makers, the private sector and NGOs. The findings of the present study show a few examples such as the Kirinyaga stakeholders' forum, which had its limitations (see **section 9.3.2**); the collaboration between KARI, CRS, CCS, Farm Africa and the Ministry of Agriculture in developing the metal grain silo; the collaboration between Farm Africa Harvest, the Ministry of Agriculture and TechnoServe in producing and marketing TCB; and the collaboration between CCS, CRS and farmers in developing the nine-seeded hole technology where actors worked together to solve a specific problem. As discussed below in **section 9.1.1**, farmers' groups acted as platforms for farmers belonging to a group, which provided mechanisms for linking farmers to other actors in solving their common problems. The present study further showed that although actors appreciated the need for working jointly, there were limited mechanisms to foster collaboration and most pursued their own objectives and worked independently. This finding suggests the need for creating platforms or “theatres of innovation” that facilitate actors within sub-systems to talk to each other and tap each other's strengths.

Röling (2004:7) emphasised that the different actors need to “see themselves as forming a system and ... [be] aware of their mutually complementary roles with respect to a synergistic outcome.” Röling (2004:5), asserted that an AKIS will “hold promise that a set of complementary actors gel into a synergistic system once they begin to see themselves as a system”. This finding suggests the need to increase awareness of working as a system in bringing about agricultural development in rural areas. The present study did not focus on the construct “awareness” because this valuable contribution on the value of awareness by Röling (2004:5) was accessed after the field work had been completed. An



an area for further research, would be to assess the level of awareness of the AKIS by the actors of the system.

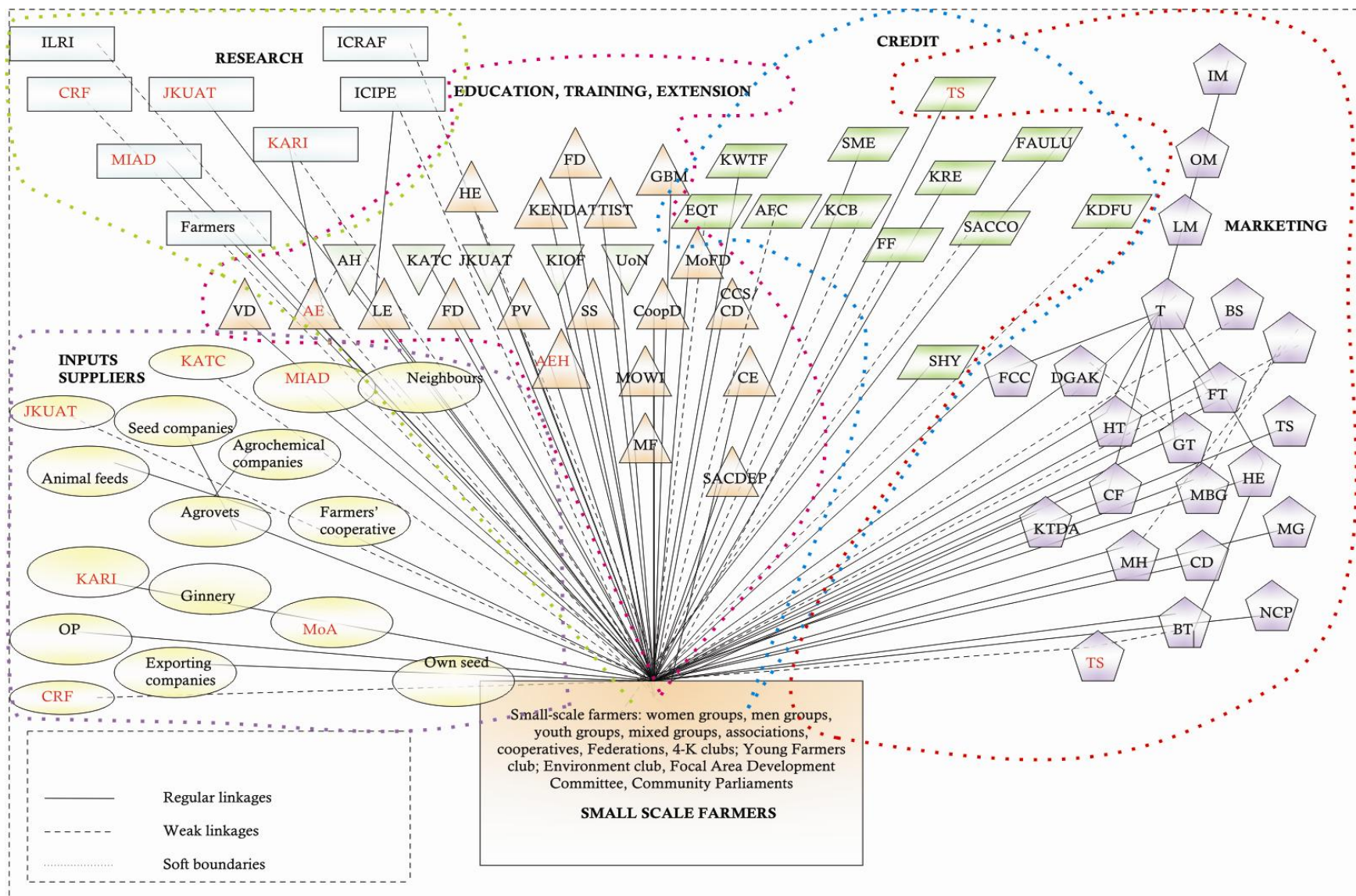


Figure 38: Basic configurations of the AKIS of Kirinyaga district

## Legend



**Input  
suppliers**



**Research**



**Extension, training  
and education**



**Marketing**



**Credit**

KARI – Kenya  
Agricultural Research  
Institute

MoA – Ministry of  
Agriculture

MIAD – Mwea  
Irrigation Agricultural  
Development Centre

Farmers' cooperatives  
– societies, factories,  
agencies

OP – Oxen ploughing

CRF – Coffee  
Research Foundation

JKUAT – Jomo  
Kenyatta University  
of Agriculture and  
Technology

KATC - Kamweti  
Agricultural Training  
Centre

MIAD – Mwea  
Irrigation  
Agricultural  
Development  
Centre

KARI – Kenya  
Agricultural  
Research Institute

JKUAT – Jomo  
Kenyatta  
University of  
Agriculture and  
Technology

ICIPE –  
International  
Centre for Insect  
Physiology and  
Ecology

ICRAF – World  
Agroforestry  
Centre

CRF – Coffee  
Research  
Foundation

ILRI –  
International  
Livestock Research  
Institute

*Public / government*

AE – Agricultural extension

LE – Livestock extension

FD – Forestry Department  
MOFD – Ministry of Fisheries  
Development

MOWI – Ministry of Water &  
Irrigation

VD – Veterinary Department

SS – Social services

CoopD – Cooperative

Development

CE – Community elders

MF - Model farmers

*Private*

PV – Private veterinary

HE – Horticultural exporters

*NGOs & religious organisations*

CCS – Christian Community  
Services

CD – Catholic Diocese

AH – African Harvest

SACDEP – SACDEP

KENDAT – Kenya Network for  
Dissemination of Agricultural  
Technologies

TIST – The International Small  
Group Tree Planting Program

GM - Greenbelt Movement

KATC - Kamweti  
Agricultural  
Training Centre  
JKUAT – Jomo  
Kenyatta

University of  
Agriculture and  
Technology

UoN – University

of Nairobi

KIOF – Kenya

Institute of Organic

Farming (NGO)

AH – African  
Harvest (NGO)

HE – Horticultural exporters  
MBG – Milk buying groups  
KCC – Kenya Cooperative  
Creameries

BS – Brookside

MH – Milk hawkers

CF – Coffee factories

KTDA – Kenya Tea

Development Agency

BT - Banana traders

GT – Goat traders

DGAK – Dairy Goat

Association of Kenya

HT – Honey traders

FT – Fruit traders

T – Transporters

FCC – Farmers Cooperatives,  
coffee

LM – Local markets

OM – Other markets (Nairobi,  
Mombasa)

IM - International markets

TS – TechnoServe

Drumnet

FF – Family  
Finance

Eqt – Equity Bank

AFC – Agricultural  
Finance

Cooperation

KCB – Kenya

Commercial Bank

Farmers' SACCOS

Kirinyaga District

Farmers Union

SMEP – Small  
micro enterprise  
programme

KWFT – Kenya  
Women Finance  
Trust

TS – TechnoServe

SHY - Shylocks

## 8.8 Key features of the system

In addition to the Systems approach and the Soft systems perspective, the Knowledge systems perspective and the Knowledge and information system (KIS) perspective guided the study in identifying the key features of the AKIS (see **sections 3.2.1.1.3** and **3.2.1.1.4**). The Systems approach and Soft systems were explained under definition of key terms in the preliminary pages, while systems in the context of AKIS was discussed in **section 4.1**. The Knowledge systems perspective, which is embedded in the Soft systems approach helped to explain aspects of the study pertaining to the sharing of knowledge among key actors (Röling 1988; 1989; Engel 1995; 1997:23; Salomon and Engel 1997a). The Knowledge perspective focused on institutional actors and offered an holistic and inclusive character that stimulated discussion and learning among practitioners. It considered what people knew and how they responded, and took research, education, mass communication and policy making perspectives into account. The heart of the Knowledge systems perspective is grounded on the assumption that knowledge generated from one part of the system is transformed and utilised in other parts of the whole (Röling 1989:51).

The KIS perspective centred on organisations and individuals, and the networks, links and interactions among actors and how they could work in synergy (Salomon and Engel 1997a:19; Röling 1998:33). The KIS approach helped to explain the social organisation of knowledge in agriculture (Engel 1997:31). Each of the six main sub-systems described below had its own peculiar features. This section presents the results and interprets findings responding to the second component of research **question 2.3: What AKISs (relevant to small-scale farmers) are present in the district? *What are the key features of the system(s)?*** Data corresponding to this section were collected using a “bricolage” of methods employed by the study (questionnaire, interviews, focus group discussions, PRA, RAAKS and observation), and are summarised in the RAAKS basic configurations window (see **Figure 38**).

### 8.8.1 Small-scale farmers’ sub-system

The different categories of producers in Kirinyaga district including i) farmers’ groups, which comprised associations, cooperatives, federations, committees, “Community parliaments,” networks and young farmers (see **sections 6.2.1, 6.3, and 9.1.1**); and ii) individuals who produced as households comprising individual farmers who belonged to a group, and individual farmers who were not affiliated to any group. iii) The small-scale farmer sub-system also included model or innovative farmers who were regarded as role models in the communities and iv) school children. Results from interviews, RAAKS, observation and PRA methods (Time lines, Venn diagrams, Service and opportunity maps) showed that farmers used information from different sources that were key actors in the AKIS. The different categories of farmers generated, shared and exchanged

information and knowledge with group members, other community members and other actors (see **Chapters nine and ten**).

Findings of the present study were consistent with Hoffmann, Probst and Christinck's (2007:359) that farmers played an important role in disseminating agricultural innovation because "they see knowledge in practice," and have new knowledge that they can share orally through social networks. This finding demonstrates that farmers and farmers' groups were not mere recipients of agricultural information and knowledge but were active actors in the generation, dissemination and use of agricultural knowledge and information. In his assessment of agricultural information needs, Morris (2007:17) found that some organisations in South Africa sought information from farmers' groups and individual farmers. These findings suggest that there was need to expand and strengthen the capacities of farmers' group institutions through training in organisational development to equip the groups with sufficient skills to work with actors in other sub-systems and increase agricultural productivity.

One type of group that deserves special mention within the sub-system of small-scale farmers is the young farmers or the "future farmers" category, which comprised primary school children in 4-K and environmental clubs, and secondary school children in Young Farmers clubs (see **sections 6.3.1.5 and 8.8.1**). The present study showed that this group was important for the sustainability of farming activities. School children for example shared what they learned in their clubs with their parents, relatives, neighbours and friends. Noordin *et al.* (2001:219) established that learning took place through agricultural classes, demonstrations and 4K clubs at schools. Swanson (2008:5) observed similar clubs in North America, Europe, the Caribbean and developing countries such as Tanzania and Nigeria. Wirastuti *et al.* (2008:137), who confirmed that schools and their teachers played a key role in educating pupils and the community at large on farming issues.

Despite their important role in future farming, the demographic findings on age of farmers revealed that there were very few farmers between the age group of 18 to 25 (see **section 6.2.4**). The youth were not attracted to agriculture because of the low returns hence migrated to the cities and towns after finishing school or college in search of jobs. This pattern has implications on the sustainability of farming activities in Kenya and other parts of the world. This finding points to the need to devise strategies for attracting the younger people into farming and to reverse the rural-urban migration pattern. Among the barriers and constraints raised by the youth were they did not own land, they did not have access to credit or collateral, and they did not have sufficient farming skills (see **section 12.2**). This finding implies the need to develop policies that provide agricultural support to the youth and that encourage schools and colleges to inculcate interest in farming in the youth.



### 8.8.2 Extension, education and training sub-system

Sections 4.5.2 and 4.5.4 described the roles of extension and training and education institutions in an AKIS. This study found that the extension, education and training component in the AKIS of Kirinyaga district comprised extensionists from various government ministries and departments, NGOs, research, parastatals, and the private sector. The key actors from each of these categories included:

- Government ministries and departments - Ministry of Agriculture, Ministry of Livestock Development, Veterinary Department, Forest Department, Ministry of Fisheries Development, Ministry of Gender, Children and Social Services, Ministry of Water and Irrigation and Ministry of Cooperative Development.
- Parastatals - The active parastatals were the NIB, which provides and manages irrigation water, the HCDA which provides information and advice on horticultural production, horticultural policy and market information and the NCPB which collects, stores and markets cereal grains.
- Education and training institutions - The active actors included KATC, JKUAT and University of Nairobi. However, interviews with higher education representatives revealed that the enrolment figures for the agricultural degree course were declining.
- Civil society organisations - NGOs offering extension services included the Kenya Institute of Organic Farming (KIOF), Africa Harvest, Catholic Diocese, SACDEP, KENDAT, The International Small Groups Tree Planting Programme (TIST).
- Private sector - Horticultural exporting companies, private veterinarians, KTDA, which provided private extension services to farmers in tea husbandry aspects from land preparation through to pruning and plucking.

Small-scale farmers, community elders and model farmers also carried out farmer-to-farmer extension services.

As depicted in **Figure 38**, actors from most sub-systems carried out training, education and extension activities including individual farmers, farmers' groups, the private sector for example KTDA and horticultural exporting companies, NGOs and faith-based organisations, parastatals, training and education institutions and various government departments. This finding was consistent with that of earlier authors (Rees *et al.* 2000:4) (see **section 4.5**). Madukwe (2006) noted a paradigm shift in the manner in which extension services were being delivered and the emphasis on "learning" as opposed to teaching. The findings showed that although extension services were in the past offered by the government, many private actors had stepped in to fill in gaps for extension services (Rivera and Alex 2004:41-42; Madukwe 2006; Nyambo *et al* 2009:100; Rivera and Sulaiman 2009:269; 2010:65,67). In neighbouring Uganda, NAADS (2006) has had private extension services since 2001.

With regard to education and training, **section 2.2.4.4** described some of the challenges experienced in the training and education sector in Kenya. Although there had been reforms in the higher education sector, whereby public universities in Kenya introduced parallel sessions (regular students selected by the joint-admissions board and private full-fee paying students enrolled for parallel evening classes), the finding on declining enrolment figures for agricultural degree courses suggests the need for agricultural faculties in public universities to attract more students. Davis, Ekboir and Spielman's (2008:41-42) study in Mozambique also demonstrated that post-secondary agricultural education and training contributed to agricultural productivity by influencing the adoption of new technologies and enhancing innovation (see **section 6.2.5**). One strategy for attaining this is for the sector to reposition itself and align its curricula with the needs of the industry and job market to ensure there is sufficient human resource base to meet the future needs of the agricultural sector. The present study highlighted other actors outside the conventional training and education institutions who provided agricultural training and education services to farmers. As recommended by Davis, Ekboir and Spielman (2008:49) there is a need for reforms in the education sub-system to promote strategic partnerships with other non-formal actors outside the formal training and education institutions in providing agricultural training and education.

### **8.8.3 Research sub-system**

The research sub-system comprised actors from national and international research institutions, from extension, education and training, CSOs and small-scale farmers. The active actors in the research sub-system included:

- National and international research institutions / parastatals: The national / parastatal actors engaged in research in Kirinyaga district included MIAD, which is the research arm of NIB, KARI, CRF and the Tea Research Institute (TRI) / TRF. The international research actors who were active in divisions were ICIPE, ICRAF and ILRI.
- Education and training: A few local and foreign universities carried out research on farmers' fields in Kirinyaga district including JKUAT, University of Nairobi, Wisconsin University and a university in the UK.
- CSOs: The CCS and CRS were involved in some research activities with farmers on the nine-seeded hole technology and the cereals metal silo respectively.
- Innovative farmers: Some innovative farmers carried out farmer experimentation and innovation on various agricultural activities where they combined external information with their local knowledge and experience. Examples on some farmer experimentation and innovation are presented in **section 10.3.5**.
- Private sector: It was observed that there was limited involvement by the private sector actors in the research sub-system.

The research sub-system comprised actors from the public sector (national and parastatals), international organisations, the private sector, CSOs, education and training and farmers (see **Figure 38**). A number of authors (Alders *et al.* 1993; Shrestha 1996; Worth 2002) found that farmers were experimenters and innovators (see **section 4.5.3**). Research has become more participatory and is no longer a domain of research institutions alone (Rivera, Qamar and Mwandemere 2005:52-53; Van Kerkhoff and Lebel 2006:460-461). For example, the PTD, PFI and FFS models take into account the scientific and local knowledge systems (see **section 4.5.3**). Kamau (2007:208) also showed that farmers were not merely recipients of technologies but had the capacity to experiment and innovate and that the contribution of main stream research complemented their efforts towards improving agricultural practices. The empirical evidence has shown positive outcomes where participatory research has worked well. A good example was the case of the Birchip cropping groups in Australia, which involved farmers in research and extension, and engaged them in the production of communication materials (McClelland, Gartmann and Van Rees 2004:8). According to McClelland, Gartmann and Van Rees (2004), the participatory process promoted learning and increased adoption of new technologies. In Kenya, reforms by KARI aimed at strengthening the linkages between research, extension and farmers led to the establishment of ATIRI and KAPP, which help to generate and share innovative technologies, information and knowledge with other farmers (see **sections 2.2.4.1 and 4.5**). However, the study findings showed that linkages between actors were weak and suggest the need to strengthen the capacity of research actors so that their presence on the ground can be felt. These findings were in synchrony with Rivera, Qamar and Mwandemere's (2005:52-53) recommendation on the need for public collaborative research between the mainstream research institutions and other actors including farmers, policy makers, the private sector and NGOs.

#### **8.8.4 Inputs and services sub-system**

The input supplier and services sub-component comprised actors providing agricultural inputs to farmers and services such as ploughing, plant and animal health, transportation and agroprocessing. The input suppliers comprised a wide range of actors supplying seeds, breeding stock, day-old chicks, planting materials, agrochemicals, pharmaceuticals, fertilisers, animal feeds, farming implements and construction materials. Others included the cotton ginnery, rice and cereal mills, and coffee and tea processing plants (see **Figure 38**). As presented below, some input service providers doubled up in the marketing sub-system. The active actors in the inputs and service sub-system included the private sector, research, extension, training and education and CSOs as well as farmers. The key players under the inputs and service sub-system comprised:

- Private sector: Agrovets or input stockists of varying sizes provided a wide range of agricultural inputs and services. There were stockists in every sub-location though some were merely small shops that stocked a narrow range of inputs, while the larger ones were located at the townships and the major markets. Most of the other input suppliers were located outside the community.



Private veterinarians provided animal health services and semen for AI while some horticultural exporters provided seed, fertilisers and agrochemical to farmers. KTDA provided fertilisers to tea farmers, while brooders such as Kenchick and Kenbrew provided day old chicks and various feed manufacturing companies provided animal feeds. Other actors included seed and pharmaceutical companies and animal feed manufacturers.

- Research: KARI in Mwea division provided cottonseed, MIAD provided rice seed, and CRF provided improved coffee seedlings.
- Extension: The Ministry of Agriculture provided some seed, fertilisers and agrochemicals especially in responding to disasters caused by pest invasions and disease outbreaks such as army worms in plants and Rift Valley Fever and Foot and Mouth disease in animals. The Ministry also provided some inputs to 4-K clubs in primary schools.
- Training and education: JKUAT provided TCB seedlings to farmers and KATC provided a variety of planting materials to farmers including the improved sweet potato vines and tea clones.
- Civil society organisations: Some cooperatives and societies such as the coffee cooperative societies and tea society stocked inputs for their members. Some NGOs and cooperatives stocked or sourced inputs for farmers for example Africa Harvest provided TCB seedlings to farmers, while KIOF provided mushroom spawn. The CCS also provided seeds to resource poor farmers, while some farmers' groups stocked inputs for group members linked to the enterprise they were producing.
- Producers: Some farmers' groups delivered agricultural inputs to group members such as ploughing and spraying services, seeds, fertilisers and agrochemicals. Others shared germplasm they had conserved over years with other farmers and actors.

The findings on the input and services sub-sector confirmed those identified by other authors (Rees *et al.* 2000:3-4; Rivera and Qamar 2003:5). Rivera and Qamar (2003:5) emphasised the importance of input suppliers in guiding farmers on specific processes and standards. This finding demonstrates that input providers were key actors in the AKIS of Kirinyaga district, and suggested the need for training the many stockists at various levels to ensure accurate information and advice was provided to farmers.

#### **8.8.5 Credit sub-system**

Informants cited more than 11 banks, microfinance and credit institutions, cooperatives and unions providing credit to small-scale farmers. The private sector and NGOs actors provide agricultural credit to farmers in Kirinyaga district. While some provided cash in the form of loans, others preferred to provide credit in-kind, in the form of inputs. In addition, most farmers' groups had "merry-go-rounds" that advanced loans for inputs or other social or economic needs to members. However, despite the many actors in the credit sub-system, many farmers were not aware that these

institutions offered agricultural loans. This finding suggests that most small-scale farmers are ignorant of the various credit services in Kirinyaga district. Other than the AFC and cooperatives, financial institutions in Kenya, including those in Kirinyaga district, had for some time considered farming to be a risky business and did not advance credit for agricultural purposes. However, in the last decade there has been a shift in interest in financing small-scale farmers, with AFC being one of the largest lenders. The changes have been dramatic and as indicated by the findings, Kirinyaga district has many credit and microfinance institutions working with small-scale farmers. These institutions provided financial linkages and enabled farmers to acquire inputs, improve and expand their farming activities and access other production factors such as land, labour and information.

Research has shown that agricultural credit was essential as it helped farmers to increase production (Muriuki *et al.* 2003:36-37) and many authors have emphasised the need for providing credit to small-scale farmers and / or groups (Muriuki *et al.* 2003:36; Rivera and Qamar 2003:41; Oyedele *et al.* 2009:200). Pretty (2003a) found that CBOs including rural women's associations were active players in providing agricultural credit to farmers in the ACP region. The interest by microfinance and credit institutions in providing agricultural credit to farmers observed by the present study was corroborated by Lele *et al.* (2010:68) who noted that there had been "an explosion of innovation in microfinance," and in addition to the traditional actors, CSOs and the international community were key actors. According to Ruse (2006:22), the establishment of "merry-go-rounds" or rotating savings and credit associations facilitated the mobilisation of farmers into forming groups. The credit associations were perceived to be transparent and sufficient for the levels of literacy and numeracy present in rural areas.

#### **8.8.6 Marketing sub-system**

The marketing sub-system had many active players because of the many enterprises produced in the district for export, the local markets and household consumption. Most actors in the marketing sub-system were from the private sector and a few were from parastatals and NGOs.

- Private sector: The active players in the private sector included horticultural exporting companies (including cut flower companies), KTDA for tea, Kenya Planters Cooperative Union (KPCU), coffee factories and millers, rice millers, milk processors such as Brookside and KCC, and the Mwea cotton ginnery. KACE was cited as having been active in the past. Findings presented in **Figure 38** and in **section 9.1.5** below demonstrate the private sector actors involvement in the marketing sub-system. Other actors included traders and hawkers from the district and from as far as Nairobi and Mombasa. There were numerous marketing transporters using different modes of transport to ferry goods to the market (see **section 9.2.1.4**).
- Public sector: According to the informants, the HCDA theoretically provided support to farmers in finding markets for their produce, but in practice, very few farmers had benefitted from this

service. Another active player was the NCPB, which purchases, stores and markets cereal grains. The Ministry of Local Government also played a key role in providing market infrastructure in major trading areas where most farmers sold their produce and obtained market and price information.

- Civil society organisations: TechnoServe worked closely with other NGOs to provide market linkages. A good example is the partnership with Africa Harvest and the Ministry of Agriculture and who focused on the production of TCB while TechnoServe focused on the marketing of the produce.
- Producers: Some groups had formed marketing groups for their produce. The groups shared costs related to marketing such as sorting, grading and transport. A few groups had formed milk buying groups to buy, add value and sell the finished products such as yoghurt and “*mala*”<sup>74</sup> through small dairies. Milk hawkers bought milk from farmers and then went round selling it at higher prices.

The findings on the marketing sub-system provided evidence of support to farmers to gain access to markets and a strong relationship between farmers’ groups and private sector actors, a few NGOs and parastatals. The finding on farmers’ groups marketing their produce through groups was in line with that of other authors (Place *et al.* 2004:258-259; Cameron 2007:373; Galindo 2007:89; Lele *et al.* 2010:18). Their empirical evidence showed that group marketing had not only improved market access, but had helped farmers to cope with risk (Place *et al.* 2004:258-259), obtain good profit margins (Cameron 2007:373) and ensure women’s inclusion (Lele *et al.* 2010:18). The finding of the present study on marketing through private marketing companies were supported by Stringfellow *et al.* (1997), who noted strong relationships between farmers’ groups and the private sector. These findings suggest the need to streamline the marketing sub sector in Kirinyaga district to improve access to markets and price information. Lele *et al.* (2010:52) highlighted the role of development partner actors such as the Kenya Horticulture Development Programme (KHDP), which was funded by the USAID to support small-scale farmers to produce and market high value horticultural products.

Overall, the findings on the key features of the AKIS sub-systems in Kirinyaga district showed that the success of the small-scale farmers was dependent on the sum of the various sub-systems and multiple actors within each sub-system. With the exception of a few actors such as the Ministry of Agriculture, Technoserve and Africa Harvest; and the Ministry of Agriculture and KARI who occasionally worked together, most actors worked directly with farmers independent of each other. The different actors had different knowledge assets and information and knowledge was held in different “knowledge silos.” The AKIS sub-systems and their components were fragmented and

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<sup>74</sup> *Mala* is a Kiswahili word for fermented milk.

uncoordinated and there was little interaction between actors within a sub-system or between sub-systems. This segmentation made it difficult for farmers, farmers groups and other actors in the AKIS to access information and knowledge within the system because they did not fully understand how the sub-systems worked or how the entire KIS in the district worked. These findings emphasised the importance of “systems thinking” within the AKIS framework. As stressed by Senge (2006:7,42,73), synergy between the different components makes the sum exceed the total of its parts. The findings of the present study demonstrate that one could only understand the whole AKIS “system” by understanding the sub-systems. Linkage mechanisms between actors within each sub-system and across sub-systems are needed to improve the flow of agricultural information and knowledge in the AKIS.

## **8.9 Summary**

Chapter eight presented and interpreted results on objective two, which focused on the sources of external information and local knowledge. The main sources of advice and information and knowledge on farming in general, for different purposes and for market information were identified. Further, Chapter eight identified the criteria used for determining the main sources and the quality of information focusing on the ease of finding information, reliability, usefulness and relevance of information. This Chapter also identified the users of agricultural information and knowledge, the AKIS of small-scale farmers and the key features of the system.

Although there were variations in the main sources used depending on the geographic location, extension emerged the most important source of information and knowledge for small-scale farmers, followed by the private sector and neighbours. While male only groups mainly obtained advice, information and knowledge from the private sector, female only, male only and mixed groups mainly obtained information from extension. Markets were the key source of market information, followed by neighbours and other farmers and cooperatives and societies. Most of the produce of groups and individual farmers was sold in the local market. There were many users in Kirinyaga, including producers, extensionists, educators, researchers, policy makers and planners, development partners and visitors. These users obtained information and knowledge from multiple actors falling under different sub-systems. The AKISs of Kirinyaga were location specific and depended on the enterprise, agroecological conditions and the actors on the ground. However, in general, the AKIS of small-scale farmers in Kirinyaga had several sub-systems namely small-scale farmers, input suppliers, research, extension, training and education structures, credit and marketing services.

## CHAPTER NINE: LINKAGES AND FLOWS OF KNOWLEDGE AND INFORMATION BETWEEN ACTORS AND CHANNELS OF COMMUNICATION

### 9.0 Introduction

Chapter nine addresses research objective three: **Investigate the linkages and flows of knowledge and information between stakeholders and channels of communication** and responds to the subsequent research questions under this objective. The Chapter discusses the primary agricultural actors, investigates the linkage mechanisms between actors and examines the types as well as the nature and quality of relationships between actors. Chapter nine identifies the important actors and the influence in each of the four geographic divisions, and examines the information flows between actors. This Chapter also discusses the communication channels used by farmers for accessing and sharing agricultural information and knowledge, the ICTs used by gender, the ICT preferences of users and the barriers and constraints experienced with ICTs. Data responding to the research question on linkages between actors and the flow of knowledge and information was collected through selected RAAKS windows, PRA methods, focus group discussions with farmers' groups, interviews with individual farmers, key informants, government ministry officials, training, education and research institutions, NGOs, CBOs and projects and observation.

### 9.1 Primary agricultural actors

This section presents and analyses results and interprets and discusses findings on **research question 3.1: *Who are the primary stakeholders?*** As mentioned in **section 4.5**, there are many agricultural actors in an AKIS and each plays a specific role. This study identified more than 150 primary agricultural actors in Kirinyaga district, who included individuals, groups, institutions and networks that were active in the generation, dissemination and use of agricultural information and knowledge (see **Appendix 77**) presents the key actors under broad categories, and the role that each of these actors played in the AKIS of Kirinyaga is subsequently discussed below.

**Table 5: Categories of major agricultural actors in Kirinyaga district**

Categories of major actors	Number identified
Small-scale farmers (groups and individual farmers)	Many <sup>75</sup>
Government ministries and departments	17
Parastatals	8
Education and training institutions (universities, training centres, schools)	8
National research institutions (most are parastatals)	4
International research institutions	3
Private sector (agricultural inputs and service providers)	40
Civil society organisations (NGOs and CBOs, religious bodies, associations)	22
Development partners	6
Projects	6
Credit and microfinance organisations	11
Markets (local and national)	10
Media houses (radio, TV, newspapers)	10
Consumers	Many <sup>41</sup>

### 9.1.1 Small-scale farmers

There were more than 10 categories of small-scale farmers or producers in Kirinyaga district, including farmers' groups who were registered with the Ministry of Gender, Youth, Culture and Social Development (most as self-help groups), informal groups, FADCs, and CIGs, cooperatives, associations and federations (see **sections 6.2.1** and **6.3.1**). The category of individual farmers comprised model or innovative farmers, farmers who belonged to a group, and farmers who were not affiliated to any group. These farmers were involved in the production of more than 56 enterprises (see **section 6.5**). While some interacted and shared information and knowledge, others did not. Most farmers learned agricultural skills when they were young, from their parents and elders. The farmers' groups acted as mechanisms for linking farmers who belonged to groups socially and to other actors in farming activities (see **section 6.3.1**). The model farmers were regarded as role models in the community and received many visitors from the district, other parts of the country and from abroad who came to learn from them.

This study showed that there were different categories of small-scale farmers comprising individuals, groups, institutions and networks that played a role in agricultural development (see **sections 6.2** and **6.4**). Most farmers learned to farm from their parents and elders in the community, and were active consumers and generators of agricultural information and knowledge (see **sections 7.2** and **7.3**). The finding on the primary source of learning corroborated the finding of Bachmann (2000:106) that farmers in Fiji were taught farming skills in their youth by their fathers and elders in the family.

<sup>75</sup> There were different categories of small-scale farmers classified under individuals and group. Likewise there were many categories of consumers in the market who determined what to be produced and how much to produce.



Farmers' groups and farmer organisations were also a source of agricultural information and knowledge and were central to linking farmers with common interests to share their experiences, learn and experiment jointly. As pointed out by Pretty (2003a:1,9,13) the value of trust and connectedness among people, yielded social capital and the joint action contributed to the cohesiveness of individuals in their communities or societies. Heemskerk and Wennink (2004:17-24) reported that different types of farmers groups generated social capital which facilitated bonding and bridging between groups and linking of agricultural service providers. These linkages ensured inclusion of resource farmers in local innovation systems (see **section 4.7.3**). The groups which had an average of 29 members (see **section 6.4.2**) facilitated learning and the sharing of knowledge, information and ideas through face-to-face interactions. Stringfellow *et al.* (1997) observed that the cooperation and the bonding of group members was facilitated by the small size of the group, uniformity, face-to-face interactions, availability of financial resources and accountability.

Groups improved linkages between other actors, provided access to services (including knowledge and information), facilitated training in a cost-effective manner, provided entry points for the introduction of new technologies or farming practices, helped to overcome diseconomies of scale through joint purchasing of inputs and marketing of farmers' agricultural produce. The role of groups was thus to provide "platforms" that facilitated farmers to air, debate and articulate their views (Röling and Jiggins 1998). The findings of the present study corroborated those of other authors (Meyer 2000:154; Curtis and Cooke 2006; Madukwe 2006; Galindo 2007). For example Meyer (2000: 153-156) pointed out that groups brought together many farmers hence made the work of trainers easier in that many farmers could be trained at a central point. A survey evaluating the Landcare groups in Australia showed that groups played a catalytic role in rural development and had attracted new members, helped to improve communication among landholders, learning through interaction, access to resources, and building social capital (Curtis and Cooke 2006:5,16-19,20,36). Emphasising the power of farmers, Röling (2004:19) made the point that farmers had "veto power" hence were a key actor that needed to be listened to and be involved in agricultural development processes.

Some groups in Kirinyaga district worked with researchers, extensionists, training and education institutions and horticultural exporters to improve the flow of information and knowledge and agricultural productivity. The groups working with horticultural exporters had established linkages with technical experts, extensionists, input supplies, spraying service and marketing services. These findings were similar to those of other authors in Kenya (Umali and Schwartz 1994:39; Kimenye 1998:206; Ndubi 1998:114; Mulaa *et al.* 1999:27; Rees *et al.* 1999a:6; Mutua-Kombo 2001). In Australia, grower groups were working with other community groups, researchers and the private sector, and formed partnerships, which had developed into complex networks. These networks

improved the flow of information, knowledge and research outputs (Gianatti and Carmody 2007:166-171). The present study showed that committees such as FADC in rural areas facilitated the dissemination of improved technologies to farmers and improved the dissemination and uptake of technologies generally by adopting the technologies introduced by experts and acting as demonstration farms. As summarised by McClelland, Gartman and Van Rees (2004:2), “In isolation, most farmers would not be inclined, or able, to access such information.”

As presented in **section 6.4.4** under structure and funding, most groups in Kirinyaga district did not have adequate financial resources and relied on members’ contributions or proceeds from the sale of produce to fund the group activities hence some groups were not very effective. However, there were a few successful groups such as the Mutira Maziwa group in Central division that was buying, processing and selling milk products that demonstrated the benefits of working as groups. Similarly, Klerkx (2008:162) observed the challenges in funding network initiatives among Dutch dairy farmers. The connectedness of group members and the trust between them (Pretty and Wesseler 2003:3) led to the success of the group. These findings highlighted the important role of farmers and farmers’ groups in an AKIS and suggest a need for strengthening the capacities of existing groups and skills of individual farmers and providing them with the necessary resources (see **section 8.8.1** above).

### **9.1.2 Public sector actors**

The public sector comprised government ministries, parastatals (research related parastatals are presented under research institutions), public universities (discussed below under training and education institutions), colleges and training institutions.

#### **9.1.2.1 Government ministries and departments**

The present study identified more than 17 government ministries and government departments in the AKIS of small-scale farmers. Government ministries played a key role in providing policy direction and guidelines and in mapping out agricultural related activities. All the ministries listed in the inventory (see **Appendix 77**) had offices at the Kirinyaga district headquarters in Kerugoya and some had divisional offices. The district offices were supported by the provincial offices in Nyeri and national headquarters in Nairobi respectively. The ministries and departments played a key role in facilitating group formation and registration, the provision of advisory, training and extension services and development of rural infrastructure such as roads and markets. Some funding was provided through programmes and projects such as NALEP that is core-funded by various ministries and development partners, and the Njaa Marufuku Kenya project (funded by the Ministry of Agriculture), the YDF, WDF (funded by the Ministry of Gender, Youth, Culture and Social Development) and the CDF. Interviews conducted with representatives of the Ministry of Cooperatives Development, Ministry of Agriculture, Ministry of Livestock Development, and the



Ministry of Gender, Youth, Culture and Social Development indicated that there was little coordination between ministries at district and division levels. Farmers also expressed concern about the low numbers of extension staff who were overstretched in terms of their work commitments, and although extensionists were perceived to be doing a good job, they were often not accessible when needed.

#### **9.1.2.2 Parastatals**

There were about seven parastatal organisations engaged in diverse agricultural activities in Kirinyaga district namely the AFC, CRF, HCDA, KARI, Kenya Forest Services, NCPB, and the NIB. Each offered unique services to farmers and collectively facilitated the supply and management of irrigation water, generation and promotion of technologies, regulation of markets and storage of horticultural products as well as advancing credit to farmers. Some had offices in Kerugoya while others operated from outside the district. As in the case of government ministries, there was poor coordination of activities between parastatals and farmers, and with other actors in the district.

Government ministries and departments were the muscle that held the AKIS of small-scale farmers together. The ministries provided policy directions and guidelines, infrastructure, human resources in form of extension officers from divisional headquarters level to sub-location level, and facilitated community members to mobilise, form and register groups. This study found that extension was the most important source of information in all the four divisions (see **section 8.1**). However, despite the work carried out, rural road, telephone, connectivity, electricity and market infrastructure were inadequate. There were few extension workers and they were overstretched in terms of their work commitments. The agricultural expenditure as a percentage of total government expenditure was equally limiting and had been declining over the years (8.42% in 1980, 6.03% in 1990, 4.32% in 1998, 4.82% in 2000 and 4.99% in 2004) (The World Bank 2007b:18). These figures suggest the need to increase the budget allocated to the agricultural sector in order to attain the MDG and national and district targets set in the Vision 2030 and the Kirinyaga development plan.

The parastatals offered unique services to farmers such as providing market advisory services to farmers, cooling and storage facilities or credit services to farmers. Some had offices in Kerugoya while others operated from outside the district. Linkages between farmers and most parastatals as well as with other actors in the district were weak and most informants did not perceive parastatals to be an important actor in the AKIS of small-scale farmers. This was due to the resource constraints (human and financial) in the parastatals such as the HCDA. The poor linkages between parastatals and other actors in the AKIS limited their capacity to implement their plans. The capacity of parastatals thus needs to be strengthened, and their activities coordinated with other actors to ensure they fulfilled their objective of meeting the needs of the majority of farmers.

The present study showed that the public sector actors played a pivotal role in the AKIS of Kirinyaga district and provided linkage mechanisms at various levels including the headquarters, province, district, location and sub-location. The ministries provided policy direction, facilitated the formation of groups, provided extension, training and information services as well as rural infrastructure. However, the ministries had few extension staff who were overstretched and in high demand. This finding was consistent with IFAD's (2002b), and Adomi *et al.*'s (2003:391), who observed that extension services had failed to address the needs of small-scale farmers. According to Chapman *et al.* (2003:3) and Richardson (2006), this failure resulted from inadequate machinery and capacity to reach the majority of small-scale farmers and other actors, while the limited number of extensionists was caused by structural adjustment programmes that led to retrenchment and downsizing of public sector workers (The World Bank 2006a). The findings of the present study also showed that despite the major reforms in extension services, and programmes such as NALEP which had made significant contributions, it relied to a large extent on the already overstretched extension staff in terms of their work commitments to implement the activities of the programme. Nevertheless, as emphasised by Anderson and Feder (2004:55-56), the public good character of public extension services was crucial, and played a very important role in developing policy and regulations (FAO and The World Bank 2000:9). In fact according to Rivera and Alex (2004:41-43,49), the public sector was the organ that had the power to "create the conditions necessary for developing AKIS/RD." The finding of the present study, and those of other authors discussed above suggest the need to disburse sufficient resources to the public sector, and to urgently address the human resource deficit in public extension services in order to improve their efficiency and effectiveness in meeting the needs of the critical mass of small-scale farmers.

### **9.1.3 Education and training institutions**

There were three universities, four training institutions and several primary and secondary schools that provided training and education linkages in the AKIS of Kirinyaga. Two public agricultural universities (JKUAT and University of Nairobi) were engaged in some agricultural activities with small-scale farmers. Some contributed in the generation and transfer of technologies and carried out on-farm research and field trials, while others were involved in training farmers on a wide range of topics such as crop husbandry (for example TCB), and value addition (for example avocado, banana wine). In addition to the two active public universities, one foreign university (Wisconsin University) worked with University of Nairobi and farmers' groups in Gichugu division in the processing of Stinging nettle for food and medicine. Linkages between farmers and education institutions were viewed as weak and only a few farmers benefited from their services.

Four training institutions provided vocational training and demonstrations to different categories of actors in the community including extension officers, public sector actors and different categories of farmers. The KATC and the Animal Health and Industry Training Institute (AHITI) Ndoba, which are situated within the district provided conference and training facilities and demonstrations on various technologies and farming practices. The KATC offered residential and non-residential (usually one day) fee-based courses, had permanent demonstrations on its 35 acre farm, and organised field days and tours for farmers. A number of farmers said the training they attended had provided them with skills on modern farming methods or technologies. The centre had developed a comprehensive training manual, and offered demand driven courses on various topics including tube silage making, livestock breeding, coffee and tea husbandry and dairy farming.

The KATC also multiplied and distributed some seeds and seedlings such as the improved sweet potato vines. Further, the KATC held weekly open days to which farmers and other actors were invited (free service), where farmers could interact with the KATC staff, ask farming questions they had or seek for information. The centre offered some outreach services but the activities were constrained by the limited human resources at the centre and it was observed that not many farmers visited the centre on any given day. The KATC had linkages with research institutions from where they sourced new technologies and with the private sector actors who participated in training, exhibitions and open days. They plan to establish a resource centre soon.

Another training and education actor was schools. Public and private schools (primary and secondary) in the community used to teach agriculture as a subject but this subject was later withdrawn from the curricula and aspects of agriculture are now taught under science in primary schools. As presented in **sections 6.3.1.5** and **section 8.8.1**, primary schools have 4-K clubs and environmental clubs, while secondary schools have Young Farmers' clubs that provide hands on experience on various agricultural and agroforestry practices to the farmers of tomorrow. However few training and education institutions work with small-scale farmers and farmers often had to walk or travel long distances to reach these institutions. Some farmers perceived the "fee" for training offered to be too high, which acted as a barrier to accessing agricultural information and knowledge (see **section 4.7.5**).

Agricultural education and training were essential to the development of the agricultural sector in Kirinyaga district but linkages between these institutions and farmers were weak. Universities played a key role in the AKIS of Kirinyaga but with the exception of a few collaborative activities with University of Nairobi and Wisconsin University, and with JKUAT in Gichugu and Ndia divisions, informants in other divisions did not mention the role of universities in their AKISs, suggesting little activity elsewhere in Kirinyaga district. **Section 2.2.4.4** outlined some challenges experienced by

formal and informal training and education institutions linked to curricula and resources in Kenya. As pointed out by various authors (Petersen 1997; The World Bank 2007b:31), the curricula of universities and training institutions was not aligned to the needs of the industry, and government and development support for agricultural human capital had declined over the years (RoK. Ministry of Agriculture and Ministry of Livestock and Fisheries Development 2004:11). The findings of the present study and those of other authors suggest the need to review the curricula for education and training institutions to ensure a fit between the current agricultural practices and skills of farmers and other agricultural actors. As pointed out in **section 4.5.4**, recently, the University of Nairobi and Egerton University launched the Agricultural AICM programmes to address the barrier of limited skills to improve the flow of agricultural information (University of Nairobi 2009; RUFORUM 2010).

The KATC played a key role in linking different actors by providing conference facilities and having open days to which farmers and other actors were invited. Farmers who had attended training acknowledged the usefulness of the training. However, there were no visible impacts of the outreach services of KATC because of human resources constraints as evidenced by the fact that no respondents reported having benefitted from the outreach service. Most farmers perceived the location of KATC in Gichugu to be too distant hence many farmers did not attend the open days. Linked to the agricultural skills obtained by farmers from training and education institutions were schools that provided agricultural training to the youth.

Most youth gained agricultural skills from their parents and elders in the community through practice and observation but schools played a key role in sharing agricultural information and knowledge to the future farmers through clubs (see **sections 6.3.1.5** and **8.8.1**). Primary schools taught aspects of agriculture while secondary schools offered agriculture as an optional subject. The students shared what they learned with their parents, neighbours and friends. Findings by Noordin *et al.* (2001:219) confirmed the importance of clubs in schools in transferring agricultural information to students. However, there is a need to strengthen the training and education component for young farmers and to depict agriculture as a noble and profitable business to ensure that there is a critical mass of young people who are equipped with agricultural skills to succeed the current active agricultural producers.

From a gender perspective, Shibanda and Seru (2002) in Kenya showed that training for women in agriculture was limited in scope in terms of coverage of technical aspects. Findings from AKIS case studies in ten developing countries corroborated the findings of the present study, which showed a gap between research and education at universities teaching agriculture (Rivera, Qamar and Mwandemere 2005:56). The present study supports the recommendation made by Rivera, Qamar and Mwandemere (2005:56) on the need to identify skills-gaps in a collaborative manner with other actors including planners, training and education actors, relevant government departments, the

industry and producers, and on the need to offer short-term courses for farmers. It was also desirable to ensure the inclusion of women in identifying training needs in addressing the shortfall identified above by Shibanda and Seru (2002).

#### 9.1.4 Research institutions

Four national and three international research institutions worked with different categories of farmers on various agricultural related interventions. The national institutions included KARI (Mwea, Embu, Thika and Muguga), the CRF in Ruiru, the TRF and MIAD. The international research institutes that participated in agricultural research activities in the district included the ICIPE, ICRAF and the ILRI (see **Appendix 77**). The research institutions played a key role in the generation of technologies (such as the improved rice and cotton seed, coffee and tea varieties, pest and disease management) and sharing of information and knowledge. The information and knowledge generated was shared with farmers through training, demonstrations, field days, open days, shows, on-farm trials, farmer-research groups and through visits by farmers to research institutions. However, the very few research actors operating in the district worked with selected farmers and farmers' groups hence their impact was not felt by the majority of farmers. Informants of the study viewed the activities of researchers as haphazard and visited farmers only when it suited them. Some argued that researchers did not provide meaningful feedback to farmers after conducting on-farm trials. These concerns were summarised by one informant, "We do not know the role of researchers to small-scale farmers but we would like see them in the field." On the other hand, informants who had worked closely with researchers valued the cooperation but required more joint and coordinated activities. Interviews with extension officers revealed that while some researchers invited extension officers to their activities with farmers, others did not. This was despite the fact that extension officers were on the ground and farmers usually fell back to them whenever they had problems. This poor coordination between extension and research made it difficult for extension officers to backstop farmers since they were not involved in the projects or activities that were introduced.

The findings of the present study showed that there were very few research actors operating in Kirinyaga district and linkages with extension and farmers were weak. Some research institutions worked directly with farmers' groups or selected farmers, while others worked with farmers through the extension officers. This study showed that farmers were also researchers in their own right through farmer experimentation and innovation (see **section 10.3.5**). Farmers were keen to learn through direct interaction with researchers and other actors operating within their communities (Rees *et al.* 2000:14). However, Kamau's (2007:207) study on researching with farmers showed that although KARI had adopted participatory research practices and was working with farmers and extension officers through farmer-research groups, participation with small-scale farmers was sub-optimal. Bachmann's (2000:119-120) study on the AKIS of Fiji also identified weak research-



extension linkages. Besides, Baker *et al.* (2001) and Jones (2006) established that there was no synchrony between the focus of research institutions and the actual needs of small-scale farmers. Likewise, Röling *et al.* (2004:213) found that at times research was not anchored in the needs of farmers, and as pointed out by Röling *et al.* (2004), “the process of making deliberate choices to ensure the relevance of agricultural research to small-scale farmers has received relatively little attention.” For example, findings of a study showed that a researcher in Bhutan wanted to focus on maize stem borers, which was not the priority of farmers who mainly grew maize for subsistence because of low market prices. **Section 4.5.3** discussed the role of research actors in an AKIS and pointed out that although many new improved technologies have been developed, linkages between research, extension, CSOs and farmers were weak and inefficient, and often the technologies did not reach their intended beneficiaries (FAO and The World Bank 2000; Garforth 2001a; 2001b; RoK 2005a:2). These findings suggest the need to expand and strengthen the capacity of research institutions to facilitate implementation of the new participatory research models, to generate appropriate demand-driven technologies and identify communication strategies that would effectively disseminate research outputs to farmers. This democratic approach to research based on social equity would help address the complexity of the AKIS of Kirinyaga district.

### **9.1.5 Private sector organisations**

There was active participation by diverse private sector actors in the AKIS of small-scale farmers in Kirinyaga district, possibly because of the high agricultural potential and the many enterprises produced in the district that are favoured by the prevailing agroecological and climatic conditions. Some farmers in the district could afford to pay for the services of the private sector actors despite their relatively high costs because they were involved in commercial enterprises that generated good income. More than 40 private sector actors were identified in the district, which directly provided agricultural information and knowledge, as well as input and service linkages to small-scale farmers (see **Appendix 77**).

The major categories of private sector actors included horticultural exporters, agrochemical, pharmaceutical and seed companies, animal feed manufacturers, agro-processors (value addition), transporters, ploughing and plant and animal health service providers (veterinary clinicians, AI, cattle dips and spraying of plants), as well as traders, marketers and brokers who provided inputs, equipment and information related to the services and products they offered. Other service providers included millers in processing cereals and grains and stockists (agrovets) who provided a wide range of agricultural inputs. The agrovet firms were of varying sizes and stocked different inputs and farming agricultural implements. While some were small and mainly sold basic inputs such as seed and fertilisers to farmers, others were large and offered a wide range of products and advisory services to farmers. A few stockists visited farmers’ groups and provided advisory services and training.

Despite the challenges experienced with some stockists, farmers generally appreciated the services and information provided by the agrovets regardless of their size or range of products because they brought inputs, construction materials and farming implements closer to them. While some actors provided service for free, others attached a fee to services. Some groups such as Mutira Maziwa in Central division had paid experts from Nairobi to train the group on milk processing and the training had proved very useful.

Given the constrained public extension services in Kenya, the private sector played a critical role in meeting the needs of small-scale producers in rural areas. The study findings identified horticultural exporting companies, agrovets, veterinary clinicians, media, financial and credit institutions, seed and pharmaceutical companies, market intermediaries, private extension services and private sector information providers as important actors in the AKIS of Kirinyaga district. The findings on the role and importance of the private sector actors confirmed those reported by earlier authors (Umali and Schwartz 1994:30; Rees *et al.* 2000:2; Berdegúe and Escobar 2001:30; Rivera, Qamar and Mwandemere 2005:57; Spielman 2005:13; Muyanga and Jayne 2008), who showed that some private sector actors were key actors engaged in agroprocessing and marketing and in the delivery of agricultural knowledge and information.

Many private sector actors were attracted to Kirinyaga district because of its economic potential. Kirinyaga is a high agricultural potential area with diverse agroecological conditions that support a wide range of enterprises. The district is also centrally located and is near the capital city - Nairobi. Rees *et al.* (2000:2) and Muyanga and Jayne (2008), found that the private sector and agribusiness actors were skewed towards well developed high potential farming areas that had promising returns. Kirinyaga district had many actors who provided inputs, training and markets to small-scale farmers. The horticultural exporting companies provided farm and non-farm linkages, which included backward and forward linkages (Kimenye 2005:158). For example, farmers provided linkages to inputs for production and forward linkages to exporting companies that provided a market. In the case of the present study, these firms also provided linkages to employment as some firms engaged horticultural experts to advise farmers on good agricultural practices and adherence to GlobalGAP, to grade the fresh produce, to package and to transport. As summed by Garforth, Phillips and Bhatia-Kanthaki (2007:723) the private sector can be seen as “indispensable for poverty reduction.” The findings of the present study were consistent with those of Berdegúe and Escobar (2002:11), who observed an increased growth of the private sector activities over the years in the AKIS of developing countries. Likewise, Heemskerk and Wennink (2004:38-39) established that there were linkages between the private sector and farmers’ groups and economic objectives. However, the linkages between the private sector actors and farmers were weak. For example, Rivera, Qamar and Mwandemere (2005:vi) pointed out the need for establishing linkages between input suppliers such as

agrochemical and seed suppliers and producers to ensure farmers had access to inputs, and to credit and microfinance institutions to empower farmers to adopt new technologies and farming methods and access inputs (see **section 9.1.8**).

The findings on the private sector information providers such as KACE, microfinance and credit institutions and agrovets confirmed that information was a private, public and merit good. As established by Garforth *et al.* (2003:4), the present study confirmed that some information from the public sector was publicly accessible, while some was not. In the past, small-scale farmers in Kenya received free extension services on their farms as a government service in support of food production. However the inadequacies of the extension services paved way for the entry of private sector actors who brought in services that farmers needed but could only be accessed at a fee. Some farmers still had the old mind-sets of receiving information for free on their farms and were not willing to pay for training. Others could not afford to pay the fee for training. The paying of a fee for information was therefore viewed as a barrier to free flow of information. However, some farmers had paid the fee for information and realised the value of information where adequate information was accessed. KACE in collaboration with the Ministry of Agriculture provided market information to the agricultural community in the East African region. However, their presence in Kirinyaga district was dismal. Agrovets were ubiquitous in rural areas and provided information on inputs, credit and on good agricultural practices.

Spielman (2005:13) noted that while the public sector played a key role in providing agricultural knowledge and information in the public domain, the private sector actors were becoming increasingly important in delivering agricultural knowledge and information to farmers and from the private domain, especially in the supply of inputs and credit (Petersen 1997) and in production, agroprocessing and marketing activities not offered by the public sector (Rivera, Qamar and Mwandemere 2005:57). The present study confirmed those of earlier authors (Weiss, Van Crowder and Bernardi 2000:185; Zhao, Zhang and Klein 2009), who showed that some farmers paid for service regardless of cost where the returns on investment were good (see **section 4.7.4**). In their study of agricultural information systems and communication networks among dairy farmers in Turkey, Demiryurek *et al.* (2008) found that information sources from the private sector actors were among the major sources of information and identified experts, veterinarians and input stockists as the key players.

In Kenya, most agricultural information was in the public domain but the provision of some agricultural information and knowledge was fee-based, as exemplified by initiatives such as KACE (Mukhebi *et al.* 2007:24-25) and private extension services (Umali and Schwartz 1994:30; Nyambo *et al.* 2009:100). These findings suggest that while public extension continues to offer free services,



farmers should be sensitised to the need to pay for unique and valuable information and knowledge that would help improve their productivity, or provide access to new markets. However, the services offered needed to be relevant to the current needs of farmers, of high quality and affordable to the majority of farmers. Besides, as pointed out by Laurent, Cerf and Labarthe (2006:12), unlike public sector extension, private extension services are not able to fully meet the knowledge and information needs of the of farmers. In addition to production information, farmers needed information and knowledge on the environment and social aspects, which were not offered by private extension service providers. Klerkx and Leeuwis (2009:101) also found problems with embedding private extension actors in the AKIS in a sustainable manner because of conflicting interests of the private actors.

### **9.1.6 Civil society organisations**

The study identified about 22 CSOs comprising 11 NGOs and CBOs, five faith-based organisations, six associations, and several networks and religious (church) denominations working with small-scale farmers in Kirinyaga district in adaptive research and on various development activities. Among the active actors were Africa Harvest, Action Aid, Community Empowerment and Enterprise Development through Cooperatives (CEEDCO), Drumnet, Greenbelt Movement, KENDAT, KIOF, SACDEP, TechnoServe, TIST and World vision. These NGOs were perceived to be very effective in the divisions where they operated.

Some faith-based institutions were perceived to be important actors that provided spiritual and agricultural interventions. Religious institutions that worked with small-scale farmers on agricultural related activities in Kirinyaga included the CCS, Catholic Diocese, CRS, the Organisation of African Institute of Churches (OAIC) as well as other religious denominations. Faith-based organisations played a key role in disseminating agricultural information and knowledge and in adaptive research and technology transfer. For example, the CCS and partners were involved in adaptive research and were promoting an innovative maize and beans planting technology on smallholdings (nine seeded-hole technology) (GTZ Sustainet 2006). In addition, very active associations and farmer organisations operated in the district such as the DGAK, Highridge Banana Growers and Marketing Association (HBGMA), Kenya National Bee Keepers Association (KNBA), KENFAP, and the Water Users Association (WUA).

Some CSOs had introduced new technologies such as TCB, mushrooms, rabbits and metal grain silos<sup>76</sup>. Others provided skills in farming systems and practices such as organic farming, agroprocessing and extension services. A few were involved in training, provision of agricultural

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<sup>76</sup> The metal grain silo is an innovation of KARI, Ministry of Agriculture, the CRS and Farm Africa. The metal silo protects stored grains from pests and reduces post-harvest losses. The tank is airtight, thus moisture cannot get into the storage tank.

inputs, microfinance, agricultural information and knowledge as well as marketing services to farmers. For example, interviews conducted with KENFAP indicated that although KENFAP is not strictly involved in the production of economic enterprises, it plays a key role in lobbying and advocacy for issues affecting farmers who require policy redress. KENFAP was established in 1973 and facilitated market linkages and advocated for value addition, institutional development (group formation, management and capacity strengthening), training of farmers and repackaging of agricultural content for farmers (bi-monthly magazine, newsletters, e-bulletins, brochures and posters). However, responses from farmers and farmers' groups indicated that KENFAP was only present in Ndia division and had not penetrated the other divisions. Even in Ndia, most groups had not enrolled as members because they regarded the "high registration fee" as prohibitive.

The study findings showed that CSOs were important actors in the AKIS of Kirinyaga and played a role in: i) introducing new technologies, for example, Africa Harvest introduced TCB to farmers' groups while the CRS promoted the use of the metal grain silo; ii) providing agricultural training, information and knowledge such as DGAK and SACDEP; iii) linking farmers to markets, for example TechnoServe and iv) conducting research such as the CCS and the nine-seeded hole innovation. CBOs often tried to fill gaps that were not well covered by government services, and the weak extension services in Kirinyaga district provided a window of opportunity to provide agricultural information and related services to small-scale farmers. However, their coverage in the district was confined to project-based activities with limited lifespans. Some engaged in farming activities with farmers but often dropped the activities whenever the NGOs changed their programme objectives / interests or switched to new activities that attracted new funding. This limited span style of operation affected the sustainability of activities started and abandoned, and impacted negatively on the outcomes of farming activities. A few NGOs, associations and religious organisations such as Africa Harvest, TechnoServe, DGAK and CCS collaborated with the Ministry of Agriculture and other actors on some activities, while others linked directly to farmers.

The important role of NGOs in the AKIS of Kirinyaga district was observed in other developing countries (Rees *et al.* 2000:2,3; Bagnall-Oakeley and Ocilaje 2002). A few CSOs repackaged relevant agricultural content for farmers and as stressed by many authors (Mchombu 1992:29; Stilwell 2001b; Fourie 2007:30; Mangstl 2008:5), repackaging content for rural communities was important, especially for farmers who could not read or write (Giovanetti and Bellamy 1996; Morris and Stilwell 2003:80; Tire 2006:70). While some CBOs provided inputs and advisory services to farmers (Petersen 1997), others provided training, knowledge and information and disseminated technologies (Noordin *et al.* 2001:518; Ekoi and Hepelwa 2003). Still others played a key role in developing social capital and building trust and relationships at grassroots level, and in empowering farmers' groups (Heemskerk and Hennink 2004:38). The present study observed that cooperatives played a key role

in the AKIS of Kirinyaga district, especially in marketing farmers' produce. This observation confirmed findings by Bernard and Spielman (2009:62,64), who noted that cooperatives were important in reaching the rural poor, and providing credit and market linkages through collective marketing.

Some CSOs complemented government efforts (Juma 2005:16), while others supported activities pertaining to the marketing of farmers produce (Mukhwana, Nyongesa and Ogemah 2005:9). Associations such as the WUAs were effective in resolving conflicts and disputes between water users and in ensuring adherence to regulations (Neubert *et al.* 2007:17). The present study showed that some supported value addition processes. Generally, NGOS that worked with rural communities aimed at understanding the culture of the community and inculcating trust (Duke and Long 2007). Waters-Bayer and Van Veldhuizen (2005:2) pointed out that NGOs engaged with participatory innovation development with farmers had recognised the need to incorporate other actors in their field activities where they combined local knowledge of farmers with external knowledge. For example, PROLINNOVA (2010) was working with government departments, farmers, researchers, other NGOs, education institutions and other relevant actors on various aspects of agriculture and NRM. These findings supported the concept of AKIS and demonstrate the shift from working through linear models to pluralistic models that were inclusive and where synergies of each actor were harnessed. These findings suggest a need for policy to strengthen linkages between institutions and formalise relationships.

However, there were limitations in the contributions of NGOs in that they operated on project mode which had a limited span hence their activities were not sustainable. Some NGOs promised a lot yet did not live up to their promises. In addition, most NGOs did not have adequate trained staff (Noordin *et al.* 2001:518) and NGOs generally did not have a wide reach (Alex *et al.* 2002:17). Unlike extension services, which covered the entire district, the present study observed that CSOs were only effective in the divisions where they operated. The study findings suggest the need for strengthening linkages between CSOs, farmers and other actors.

#### **9.1.7 Development partners**

The study identified six development partners (donors) that had supported agricultural initiatives in Kirinyaga namely: the EU, GTZ, IFAD, the Netherlands government, Sida and USAID. They provided funding for programmes and projects on agriculture, NRM, water, human health, group management and conflict management. Others facilitated training and capacity building activities such as study tours, and provision of agricultural information and knowledge.

A number of development partner actors in the AKIS of Kirinyaga district provided funding for various projects and programmes and supported training and capacity building initiatives. The study findings were consistent with those by Stringfellow *et al.* (1997), who showed that farmers' groups became successful when they were linked to donors that facilitated participatory market approaches. The findings showed a number of programmes and projects that were supported through donor support. The FFS model is another example that had been successfully replicated in many developing countries through donor funding (Anderson and Feder 2004:52).

The present study showed that there were a few development partners with commitment to supporting small-scale farmers. The linkages between the development partners and farmers who benefited from projects in the district were good. However, it was noted that most donor funded projects were not sustainable and the activities dwindled off after the funding period. Rivera, Qamar and Mwandemere (2005:16) found that although countries like Cameroon and Uganda had adopted the AKIS/RD framework, they were heavily dependent on development partners such as the World Bank, FAO and other international NGOs, suggesting sustainability challenges. Likewise, Waters-Bayer and Van Veldhuizen (2005:2) observed that some development partner actors worked with farmers in participatory innovation development activities (PID) but shut out other actors such as researchers. Waters-Bayer and Van Veldhuizen (2005) encouraged the inclusion of research institutions to ensure sustainability. Despite the support from development partners, it has been observed that programmes and projects supported through donor funding collapsed when the funding period came to an end. Munyua (2003:65) and Rivera and Qamar (2003:15) cautioned on the need for exit strategies that ensure a smooth transition until the activities became sustainable. These findings suggest the need to build in sustainability strategies on donor supported initiatives to ensure continuity of agricultural projects and programmes in rural areas once the partner withdrew.

#### **9.1.8 Credit and microfinance institutions**

Access to credit facilitated small-scale farmers to access inputs and other production factors, and as already mentioned in **section 8.8.5**, Kirinyaga district is endowed with credit and microfinance institutions. Among the most active players in the district were the AFC. An interview conducted with the AFC informant showed that AFC had been a long-time partner of the farming community and had been financing rural agricultural activities in the country for more than 40 years. AFC provided agricultural loans to small-scale farmers, farmers' groups and cooperative societies and traders. The Kirinyaga District Farmers' Union (KDFU) and the Kirinyaga District Farmers' SACCO (KDFS) have supported a number of farming activities in the district. Other supportive institutions included Equity Bank, Cooperative Bank, Kenya Commercial Bank, Family Finance, KWFT, KREP, tea, coffee and rice SACCOs and TechnoServe. In addition, the Small Micro Enterprise Programme, women microfinance institutions and table banks that were owned by

entrepreneurs or women groups such as the Umoja Women Microfinance, shylocks and numerous “merry-go-rounds” provided agricultural credit and microfinance to farmers (see **section 6.3.1**).

According to Ruse (2006:22), groups that do not have growth strategies and saving schemes are not likely to succeed. The present study confirmed that farmers often had access to information and knowledge but could not implement their ideas because they were resource poor (see **section 2.3.1.3**). Most farmers could not afford to buy inputs or mobilise other production resources such as leasing land, ploughing and value addition. The findings of the present study on resource poor farmers corroborated those of Stringfellow *et al.* (1997) and Neubert *et al.* (2007:47), who found that the poorer farmers had very little or no access to credit and could not purchase sufficient inputs. Maatman and Schader (2009:5) reaffirmed that financial institutions in Africa still found it difficult to provide credit to farmers.

The present study showed that there were many agricultural credit and microfinance services for farmers in Kirinyaga district, and according to some key informants, this was because of a history of good loan repayment. The good repayment track record led to the mushrooming of microfinance and credit institutions as well as cooperatives. Some farmers’ groups encouraged members to take loans and provided group security for members to enable them to implement farming initiatives and the group was held accountable for defaulters. Likewise, Owusu-Frimpong’s (2008:190) study in Ghana reported good repayments especially among rural women attached to projects. Similar findings were obtained by Stringfellow *et al.* (1997), who found that cocoa farmers who operated through the network of cocoa primary societies were successful because they could access credit from Barclays Bank of Ghana. In contrast, Adegbite (2009:123-124) found a low repayment performance by beneficiaries of agricultural loans from the Ogun State Agricultural and Multi-purpose Credit Agency in Nigeria.

An evaluation study of Drumnet by Giné (2005) found that although there were many credit and microfinance institutions in Kirinyaga district, access to credit for most small-scale farmers remained a barrier and very few farmers had applied for agricultural credit. Giné’s (2005) study further revealed that although some farmers accessed credit and microfinance from lending institutions, there were many more who did not have access to this invaluable service. Findings by Kibaara *et al.* (2009:53) showed that industrial crop farmers in high potential areas had more access to agricultural credit than farmers in marginal areas. According to Kibaara *et al.* (2009), 61-65% of households in Central province received credit. According to Muriuki *et al.* (2003:37), the successful agricultural small-scale microfinance lending institutions in Kenya were KREP Bank, Faulu Kenya, KWFT, and some NGOs such as Care Kenya and Plan International, cooperatives, “merry-go-rounds” and Rotating Savings and Credit organisations (ROSCAS), and Drumnet (Giné 2005). Trends from 1997



to 2007 revealed increased access to agricultural credit by rural communities in Kenya (Kibaara *et al.* 2009:53).

Many authors (Francis 1998:78; Doss 2001:2081; Fatima 2009:1051; Oyedele *et al.* 2009:196; UNECA 2009:136) have shown that most agricultural credit beneficiaries were male farmers. Although the analysis of credit provision by gender was beyond the scope of the present study, studies have shown that gender disparities disadvantaged the key breadwinners and led to the exclusion of women from the productive agricultural sector. Gender inequality had denied women access to credit (RoK. Ministry of Finance and Planning 2002a:27), and as pointed out by the UNECA (2009:136), fewer women were accessing credit. For example, Oyedele *et al.* (2009:196) found that 94.7% of the credit beneficiaries in Nigeria were male-headed households. The study by Fatima (2009:1051) showed that most women in Pakistan did not take loans because they did not have a culture of borrowing, or lacked collateral and adherence to social norms or prestige.

The findings of the present study suggest that there was a need to provide timely, accessible and affordable agricultural credit and microfinance to enable farmers to access inputs and other services to improve agricultural productivity. Further, the findings indicate that there was a need to develop gender sensitive strategies that ensure that disadvantaged groups such as women and the youth received agricultural credit. Development partners could play a role by offering low interest agricultural credit to poor farmers who did not qualify for credit from existing credit and microfinance institutions (the credit unworthy). Linked to credit for buying inputs, Sanchez, Denning and Nziguheba (2009:40) suggested a sustainable approach where farmers were provided with subsidies for inputs. The levels of subsidy were then revised downwards over seasons, and subsequently the farmers were linked to credit schemes. The finding on low awareness on the services offered to farmers by credit and microfinance institutions suggests the need to increase awareness of the availability of agricultural financial services to farmers.

#### **9.1.9 Markets**

There were nine major markets in Kirinyaga district namely Kagio, Baricho and Sagana markets in Ndia division; Kutus, Kagumo, Kerugoya and Kibirigwi markets in Central division; and Makutano and Wan'guru markets in Mwea division. Gichugu division did not have a major market but had several small markets, thus farmers relied on the other major markets in the district. Other outlets for farmers' produce included the Nairobi and Mombasa markets, while some produce was exported through Nairobi-based exporting companies. Other market players included traders, brokers and hawkers. Markets were a key actor in Kirinyaga district and provided a social platform for the interaction of actors from different sub-systems.

As discussed in **section 8.3**, local markets such as Kagio and Kutus were a key source of information, knowledge and opportunities for farmers in Kirinyaga district. Local markets were important because they provided a number of services to farmers, and provided opportunity for social interactions. Markets provided linkages to most sub-sectors and actors in the AKIS and services. For example, they provided linkages to information, inputs, transport and financial services. Markets were also social places where people met and exchanged views and ideas. Sturges and Neill (2004:61) perceived markets to be “the best” points for informally sharing and exchanging information. As pointed out by Davis (2004:102), farmers who were far from markets or town centres often missed on information and opportunities.

Markets provided marketing outlets for farmers’ produce and as noted by La Trobe (2001:185-186), there were advantages in marketing produce directly to consumers as this circumvented the intermediaries in the marketing chain and was more beneficial to the producer and the buyer. Rivera, Qamar and Mwandemere (2005:31) confirmed that availability of markets enhanced agricultural productivity by providing an outlet for farmers’ produce. The study findings and those of other authors have implications for information providers. For example, the Ministry of Agriculture in Kirinyaga district had set up “information desks” at major local markets where farmers and other actors could access agricultural information. This finding suggests that there was a need for other information providers to tap into the opportunity provided by markets and establish information hot spots where farmers could access agricultural information and knowledge while buying or selling goods. This finding also had implications for the Ministry of Local Government and other actors involved in the construction of market places to provide stalls and facilities such as internet and electricity for knowledge and information vendors.

#### **9.1.10 Media houses**

As noted in **section 8.1**, radio was one of the main sources of advice, information and knowledge on farming in Kirinyaga district. Media houses especially the vernacular FM radio stations played a key role in disseminating agricultural information and knowledge. The main media players included *Inooro* and *Cooro* radio stations, *Citizen*, *Kenya Broadcasting Corporation* (KBC) and *Nation*. Some farmers had access to TV and among the main channels airing agricultural programmes were *Nation*, *Kenya Television Network* (KTN), *Citizen* and *KBC*. The main newspapers included the *Daily Nation*, *Standard*, *The East African*, *Taifa Leo* (Kiswahili for the nation today) and *Baraza*. However, very few farmers read newspapers for market information and agricultural topics as the majority of them considered newspapers to be expensive. Others cited challenges such as low literacy levels and the technical language used.

The linkages between small-scale farmers in Kirinyaga district and the media were weak. The findings showed that only a few farmers read newspapers. Farmers also considered the technical language used by newspapers and radio to be inappropriate for them. As established by the present study, the radio was among the top five sources of information in each geographic division in Kirinyaga (see **Figure 26** under **section 8.2.5**). Many other authors (Bachmann 2000:65; Davis 2004:129; Rivera *et al.* 2005:59) showed that media houses and in particular radio stations were important actors in the AKIS of small-scale farmers. Findings by Rivera *et al.* (2005:59) showed that the radio provided information and knowledge on new technologies, best practices and policy. Although most rural households in Kirinyaga district did not have TV sets, TV and the print media houses emerged as important actors. Media is important and has potential for improving the flow of agricultural information. Media houses therefore need to programme their messages to meet the needs of their rural audiences and to broadcast the programmes when farmers are at home. This finding was consistent with that on barriers on the use of ICTs presented ahead in **section 9.5.7**. This implies that media houses needed to change the broadcasting times of agricultural programmes and improve the content delivered.

#### **9.1.11 Networks**

Some farmers' groups had amalgamated to form networks such as the Rungeto Leaders Group, which linked eleven farmers' groups working on tree and fruit tree nurseries in Gichugu division. Such networks played a key role in promoting and scaling up new technologies, displaying innovation and improving farming methods and the conservation of the environment. Clans and other social and community networks are discussed in detail in **section 9.3.6**.

Some of the social capital concepts discussed in **section 3.2.2.3** applied to the findings on farmers' networks. The premise of this concept was that linking the interactions of people by networks facilitated the movement of information between members (Collier 1998:2; Rose 1999:2). Farmer's networks such as the Rungeto Leaders Group in Gichugu division were useful in spreading ideas, information and knowledge to groups and individual farmers and facilitated learning. Similar activities were carried out by farmers' group networks such as the MVIWATA and the MWIWAMO (Masandika and Mgangaluma 2006:87) in neighbouring Tanzania (see **section 4.5.7**).

Networks provided a bridge that facilitated social connections between groups and encouraged new initiatives (Pretty and Wesseler 2003:5). Networks with other institutions strengthened internal and external linkages and provided opportunities for transferring competencies and skills (Munyua 2003:68). For example, the Birchip cropping groups in Australia had a network of more than 30 groups, and the group had formed an alliance with another research group to provide increased opportunities and reduce duplication of effort (McClelland, Gartmann and Van Rees 2004:6). Curtis



and Cook's (2006:20) survey of Landcare groups in Australia showed that 70% of the groups belonged to some form of network, and observed that the social capital of the networks improved communication, access to information and resources, understanding of broader community issues and improved collaboration between groups.

The study by Kiptot *et al.* (2006) in Siaya and Vihiga districts in Western Kenya showed that informal social networks such as farmer-to-farmer dissemination played a key role in disseminating agricultural technologies. According to Kiptot *et al.* (2006), agroforestry seed and knowledge were largely shared along kinship lines. As demonstrated by the study findings and other authors, social capital promoted cooperation, coordination and collaboration between groups (Dekker and Uslaner 2001:xvii,1), and the face-to-face contacts facilitated cohesiveness of social networks (Borgman 2008:22). Guèye's (2009:120) study showed that the African Network for Rural Poultry Development had provided an effective mechanism for exchanging information on poultry. However, effective networking required self motivation, voluntary collaboration and philanthropic ideals by members of the network (Guèye 2009:122).

#### **9.1.12 Information centres and libraries**

The present study showed that there were very few resource centres or libraries in the rural areas of Kirinyaga district (see **section 11.1**). However, there was a library and an "Information desk" at the district headquarters in Kerugoya, while divisional offices had small agricultural collections. The "Information desk" was open to the public and the collection was managed by an agricultural officer. The MIAD centre and most institutions in Kirinyaga district housed small in-house agricultural collections that were mainly for use by staff. It was observed that there were no resource centres or libraries in the rural areas. Other important agricultural collections included the AIRC and the Ministry of Agriculture Library in Nairobi; the KARI library and information services and its branch libraries; the National Museums of Kenya, which houses KENRIK; libraries of other government departments, international organisations, training and education institutions; and CSOs including farmer organisations that provided valuable external and indigenous information services (see **section 2.2.4**). Most farmers were not aware of the existence of these resources and their usage was restricted by distance and the cost of transport.

Linkages between farmers and information centres and libraries in Kirinyaga district were insignificant. There were very few resource centres or libraries in Kirinyaga and they did not have comprehensive agricultural resources. Most were small collections which were managed by an officer in the establishment (non-information professional). These findings corroborated those established by Kiondo (1998:217) in Tanzania, who found that there were a few libraries that were established to support literacy programmes in rural areas. However, the libraries ceased to operate

due to budgetary cuts by the government when the adult education programme period ended. Besides, these libraries did not have trained staff to manage them, and did not have ownership from the community. In contrast, rural communities in Uganda perceived rural telecentres to be important community institutions that provided linkages to information hence supported the centres through contributions, volunteering in the activities of the centres and participation in decision making (Munyua 2003:47-48). As established by Munyua (2003), ownership and participation by the community were key elements of sustainability of community centres. Peters and Austin (1994) also considered ownership to be pivotal in achieving superior quality, service, innovation and sustainability.

As emphasised by many authors (Stilwell 2001a:200; Mchombu 2004:33; Aina 2007:4; Idiegbeyan-Ose and Akpoghome 2009:027) resource centres or libraries were important hubs that improved access to information to rural communities (see **section 8.1.2**). To facilitate the establishment of such centres, Mchombu (2004) developed a handbook providing guidelines on the establishment of community information resource centres. Considering the gender differences in accessing information, Mchombu (1999) provided special design consideration for centres targeting female farmers. Sturges and Neill (2004:195) and Stilwell and Munyua (2009) highlighted a number of mobile options that could be adapted to provide agricultural information to rural communities. Most of the actors in the libraries and resource centres category that participated in the present study were not accessed by farmers because of their location in Nairobi or Kerugoya, and because of low awareness of what they offered to farmers. Apart from MIAD and KATC, there were very few resource centres in Kirinyaga district that stocked agricultural information. This finding was similar to Adomi *et al.*'s (2003:391) in Nigeria. These findings point to the need to establish resource centres in rural areas to provide access to agricultural information to farmers and other actors.

Overall, the findings on major actors in the AKIS of Kirinyaga district showed that the success of the small-scale farmer was dependent on many other actors from the public sector, the private sector, producers and CSOs. Like earlier studies (Rees *et al.* 2000), the findings of the present study showed that despite the large number of actors who generated and disseminated information, linkages between actors were weak. In addition, coordination of the knowledge system between the actors was poor, and the sharing of information was generally informal (Hooton *et al.* 2006). These findings in turn suggest the need to strengthen or establish linkages between key institutions, individuals and networks in the AKIS. These findings suggest the need to develop appropriate policies to strengthen the linkages and to formalise collaboration between actors.

## **9.2 Linkage mechanisms between actors and types of linkages**

This section presents and interprets findings for **research questions 3.3: *What linkage mechanisms exist between actors? What types of linkages exist?*** Data for this section was collected through interviews with farmers, key informants, government ministries, research and education institutions questionnaires completed by information providers, PRA tools and RAAKS windows.

### **9.2.1 Linkage mechanisms**

**Section 4.7.3.1** emphasised the importance of linkages and linkage mechanisms in facilitating the flow and exchange of agricultural information and knowledge. Many mechanisms, services or activities linked the AKIS actors. Findings based on an analysis of the linkage matrices showed that most actors linked directly to farmers and worked towards improving agricultural production, but there were few linkages between actors (see **section 9.2.2**). There were very few formal linkage mechanisms, and these required financial resources to run effectively. Results from interviews with government ministries, training and education institutions, research and NGOs showed various types of linkage mechanisms including fora, training, meetings, demonstrations, exhibitions, visits and tours, agricultural shows, open and field days. Linkages between farmers and the key actors in the district were grouped under five main categories by type of activity namely information and knowledge seeking, extension and training, service, market and basic and spiritual needs linkages.

#### **9.2.1.1 Information and knowledge seeking linkages**

Individual farmers and formal and informal farmers' groups including CIGs were active seekers of information and knowledge. The groups provided a unique path for seeking agricultural information, which encouraged farmers to adopt new enterprises and improved farming methods. The intensity of seeking for information was strengthened by the group approach adopted by government, CSOs and some private sector institutions. As presented in **section 7.2**, there were information and knowledge seeking linkages between farmers and the various types of information providers.

#### **9.2.1.2 Extension and training linkages**

There were extension and training linkages between farmers and extension and training actors especially the Ministry of Agriculture and Ministry of Livestock Development, including the Veterinary Department, Ministry of Gender, Children and Social Services, Forest Department, as well as other private and civil society actors. In Kirinyaga, the NALEP programme and the Njaa Marufuku Kenya had facilitated linkages between training and extension actors and farmers, which had helped to improve linkages between extension, research, the private sector and CSOs through conducting joint broad based surveys to identify needs, and thereafter outsourcing "experts" from different categories of actors to train farmers' groups. Many farmers' groups had been trained and continued to receive technical backstopping by public sector actors.

Agricultural training centres, such as KATC and MIAD, have played a key role in linking different actors and often conducted training courses, seminars and workshops, which were attended by farmers and other actors from NGOs, the private sector and public sector. These training centres also opened up their facilities to other actors to conduct workshops or training. A number of CSOs, cooperatives and societies and the private sector carried out extension and training activities. For example, the horticultural exporting companies were active in training and extension, while the KTDA sent out tea extension officers to support farmers in their fields. Among the NGOs, Africa Harvest worked with the Ministry of Agriculture and TechnoServe to provide training and extension services for TCB, while SACDEP carried out training in value addition of bananas. The Greenbelt Movement and TIST undertook extension and training in tree nursery establishment and environmental conservation in general. **Appendix 77** highlights other training and extension actors and the role that each played in training and extension in the AKIS of Kirinyaga. The collaboration between Africa Harvest, TechnoServe and the Ministry of Agriculture to provide training and market linkages demonstrated the role of training in facilitating linkages between actors. The many training sessions carried out by different actors, and the demand for more training by farmers (see **section 12.2**) showed the importance of training in the dissemination of research outputs such as TCB to farmers, and how training helped to increase adoption rates.

#### **9.2.1.3 Research linkages**

Research linkages were demonstrated through a number of collaborative research projects. For example, KARI worked with the Ministry of Agriculture and farmers on the control of Striga using the push - pull technology. There were some research linkage activities between international and national research institutions. For example, ICIPE worked with KARI and FFSs on the push-pull technology and on other IPM approaches. Informants of the present study also cited research linkages with the private sector, training and education institutions and CSOs. For example, collaboration between KARI, CRS, CCS, Farm Africa and the Ministry of Agriculture had led to the development of the innovative metal grain silo. There were linkages between KARI and producers, which were demonstrated through the development of a new cotton variety (Hart 89M). Farmers were also innovators and through experimentation on their farms, they had mixed local knowledge and external knowledge to arrive at various innovations. For example, the collaboration between the CCS, farmers and other actors led to the development of the nine-seeded hole technology (see **section 8.8.3**). However, most farmers said that they had not seen researchers on the ground as they only worked with a few selected groups or individual farmers. A few farmers who had worked with researchers stated that they felt “used” because they did not receive feedback from researchers after carrying out joint research. Generally, the linkages between research, extension and farmers were

weak and there was poor coordination between the actors. These findings suggest the need for joint planning in meeting farming objectives and in solving local problems of farmers.

#### 9.2.1.4 Service linkages

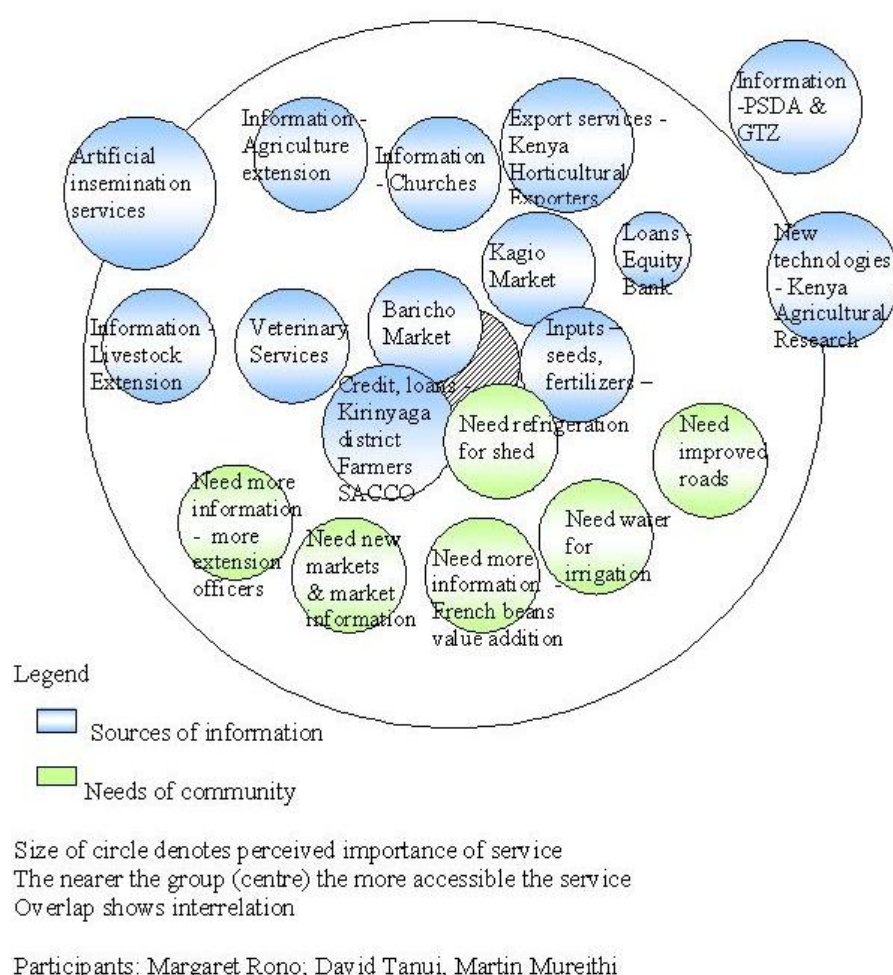
There were various linkages that provided services to farmers as depicted in the Service and Opportunity maps (PRA) of Gitaku sub-location, Mwerua location in Ndia division (see **Figure 39**) and of Gatu sub-location, Baragwi location in Gichugu division (see **Figure 40**). The study identified a number of service linkages including:

- *Plant and animal health service linkages*, which existed between farmers and companies like Juanco that provided spraying services for cotton, or horticultural exporting companies, which provided services for the control and management of pests and diseases. Other service linkages existed between farmers, veterinarians, and clinicians who offered animal health care and AI services.
- *Ploughing service linkages* between farmers and oxen-plough service providers, which was the preferred method of tilling land in the hilly terrain, and tractor hire service providers in the lowland areas.
- *Irrigation water service linkages* between the WUA, which provided linkages between farmers and NIB and facilitated the enforcement of regulations laid out for water usage.
- *Transport service linkages* between farmers and transport service providers such as donkey carts (especially in Mwea), bicycles, head <sup>77</sup>carriers (*kua*), pickup trucks, mini-trucks and lorries which ferried farm produce to local markets or inputs to farmers.
- *Soil sampling and analysis service linkages* between farmers and the Ministry of Agriculture extension officers, who sampled farmers' soil and took the samples to the KARI laboratory in Embu or the National Agricultural Laboratories (NAL) in Nairobi for analysis. These linkages were, however, isolated as very few farmers used the service.
- *Inputs supply service linkages* between farmers and input service providers of seeds, breeding stock, brooders, planting materials, agrochemicals, pharmaceuticals, fertilisers, animal feeds, farming implements, planting materials (banana plantlets, mushroom spawn) and construction materials to farmers. A number of institutions provided input linkages including agrovets, some horticultural exporting companies such as Frigoken, cooperatives, KARI (cotton seed), CRF (improved varieties of coffee clones), MIAD (rice seed varieties), KATC (rabbit breeding stock, sweet potato vines), JKUAT and Africa Harvest (TCB plantlets) and CCS that provided inputs to resource poor farmers) and the Ministry of Agriculture which provided seed to some 4-K clubs.

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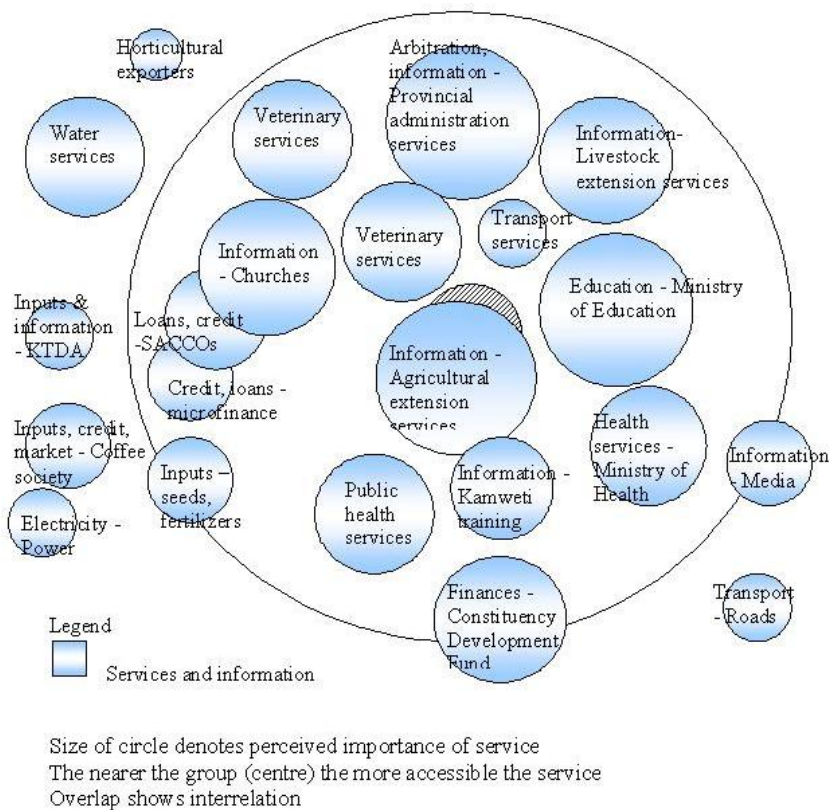
<sup>77</sup> Head carriers (*kua*) – Some people offered transport services by carrying the goods on their heads.

- *Credit service linkages* connected farmers to agricultural related credit services to facilitate the access of inputs. Farmers obtained credit from “merry-go-rounds,” savings and credit cooperatives, microfinance institutions, AFC and commercial banks.
- *Horticultural produce cooling service linkages* were provided by the HCDA.
- *Agroprocessing service linkages* provided farmers with milling services for grains (rice, maize) while other agroprocessing linkages were observed with coffee cooperatives, unions and societies, KTDA for tea, and SACDEP (banana processing).
- *Other service linkages* existed between farmers and the Ministry of Gender, Children and Social Services for group development (mobilisation, group registration and arbitration (conflicts in farmers’ groups)).



**Figure 39: Service and opportunity map of Gitaku Sub-location, Mwerua location, Ndia division**





**Figure 40: Service and opportunity map of Gatu sub-location, Baragwi location, Gichugu division**

### 9.2.1.5 Marketing linkages

Various private, public, civil society and producer actors were involved in facilitating market linkages. The main marketing actors included markets, hawkers, brokers, traders, cooperatives and some NGOs. For example:

- As mentioned in **sections 6.3.1.4 and 8.3.1**, some farmers had formed marketing groups, which provided marketing linkages and facilitated the marketing of farmers' produce.
- Linkages had been forged between Africa Harvest, which worked with TechnoServe and the Ministry of Agriculture in Central division help farmers to produce and market TCB.
- Brookside and the KCC worked with farmers' groups to market milk.
- Horticultural exporting companies such as Frigoken provided market linkages to farmers and farmers' groups.
- KTDA provided market linkages for tea while coffee factories, cooperatives and millers provided market linkages for coffee.

- There were market linkages with transporters who carried produce from farms to markets (see **section 9.2.1.4**), and with other agroprocessors (such as rice millers, cotton ginnery, maize millers and milk processors).
- There were marketing linkages between farmers and marketing intermediaries such as brokers, traders and other intermediaries, or through other farmers who had entrepreneurial and marketing skills (farmer collectors). Hawkers provided market linkages and collected produce from farmers at designated collection sheds or at the farm gate and delivered the produce to secondary or terminal markets

#### **9.2.1.6 Basic and spiritual needs linkages**

A number of external actors linked with local actors in Kirinyaga to provide basic human needs and spiritual needs. For example:

- The World Vision provided linkages to shelter for needy households.
- IFAD facilitated the provision of health, water and sanitation through programmes linking farmers to these services.
- There were linkages with the Ministry of Water, the NIB and the WUA for the provision of water for domestic use and irrigation.
- The Ministry of Health provided health services as well as food safety and nutrition.
- A few actors collectively provided the rural communities with locally generated electricity.
- In Central division, the CCS worked with the Ministry of Agriculture to support the very poor people in semi-arid areas and provided relief food, seed, training and extension services to enable them grow food for their own use.
- There were social linkages established between group members and with other community members. A number of self-help groups in the district worked with churches and other actors to support orphans in the community.
- The CCS, the Catholic Diocese, and other churches supported the less fortunate in the community to provide food, health, education.
- Many church denominations and a few mosques provided spiritual needs linkages. For example, in Mwerua location, a Catholic Church women's group met regularly for prayers and worked together on vegetable gardens, while in Inoi location, the Anglican Church supported women to establish vegetable gardens and start fish farming.

Agricultural producers comprising individuals and groups needed agricultural information and knowledge to carry out different agricultural activities, which they obtained from different actors in the AKIS. For example, the needs of farmers and farmers' groups for information encouraged information seeking linkages to different actors. The present study showed that there were many different actors offering extension services to farmers. Similar findings were obtained by Umali and



Schwartz (1994:8), who established that extension services were supplied by the public sector, NGOs, universities, research institutions, the private sector actors and farmers associations and groups. The findings of the present study showed that working with groups improved extension and training linkages and helped to ensure that research outputs and information on improved farming methods reached small-scale farmers. For example, the NALEP programme had successfully provided training through farmers' groups. As described in **section 2.2.4.2**, the NALEP programme adopted a pluralistic partnership approach to extension that brought together multiple stakeholders from the public sector, the private sector, civil society and farmers' groups through the establishment of a stakeholder forum (see **section 9.3.2**). These findings corroborated those established by earlier authors (Rees *et al.* 2000:4; Carrasco 2001; Garforth 2001a).

Other studies have demonstrated the importance of having strong extension and training linkages. For example, Meyer (2000:143,194-199; 2005) established that training played a key role in improving linkages and contributed to the building of trust and honesty between facilitators and farmers in Phokoane, South Africa. In their study of FFSs, Braun, Thiele and Fernández (2000) highlighted the role of FFSs in providing extension and training linkages through self discovery based on informal education through learning by doing. Interactions between members and facilitators through meetings and the iterative processes helped to build trust. Trust influenced the acceptance of new technologies, and helped to put the local people who were isolated from external sources of information at ease, thus enabling the team to share and exchange knowledge they possessed (Powell 2003:21). Trust also lubricated cooperation and facilitated interaction with local and external actors (Pretty and Wesseler 2004:4). These findings suggest a need to provide platforms for sharing knowledge and information, as well as for training and teaching farmers new concepts (Irick 2007).

Although there were linkages between farmers and training and education institutions, the findings of the present study showed that the linkages were weak (Munyua and Stilwell 2010:12). Other authors (Eicher 1999:38; Rees *et al.* 2000; Rivera, Qamar and Mwandemere 2005:54-55) confirmed that there were weak linkages between extension and research, training and education institutions. The weak linkages between actors were in some cases caused by institutional boundaries. For example, in Kenya, government extension services fell under the Ministry of Agriculture, and the Ministry of Livestock Development, while education was under the Ministry of Education. On the other hand, research was under the Ministry of Science and Technology, and each ministry had its own goals and objectives. Coordinating activities under the different ministries was thus challenging (see **section 2.2.4**).

It was observed that farmers valued training. This is evidenced by their comments throughout the study and their concluding remarks where they stressed the need for more training (see **section 12.2**).

The high demand for training demonstrates that training provided a linkage mechanism to various actors and facilitated the dissemination of information and knowledge to small-scale farmers. Farmers generally referred to any information sharing gatherings that they were invited to, (including the focus group discussions held by the present study) as “*githomo*<sup>78</sup>” and many said “*ni twoka githomo*” meaning they came for training. Likewise, findings from AKIS case studies of ten developing countries identified the need to offer short-term training courses for farmers on various agricultural technologies (Rivera, Qamar and Mwandemere 2005:56). This finding suggests the need to strengthen linkages between the extension and training actors as well as other actors that provide training to farmers.

Although Africa lags behind in terms of publishing and sharing research outputs (Gray 2010), the findings of the present study showed that there were research linkages where researchers and farmers worked together. For example, some groups participated in on-farm trial activities in partnership with research actors, suggesting participation in the knowledge economy. Similar findings were established by other authors (Mundy and Compton 1995:139; Castillo’s 1998:204-205). Some research-farmer collaborative activities that integrated local and external knowledge had led to the development of unique agricultural innovations and discoveries on breeding, grafting, pest management, water harvesting and processing (Nwokeabia 2006:1). Such researcher-farmer linkages added validity to the assertion by various authors that an AKIS facilitates innovation (Engel 1997; Engel and Salomon 1997; Röling *et al.* 2004), and that continuous innovation and experimentation by various actors underpinned agricultural development (Choo 1998; Kibwana 2001:50). Röling *et al.* (2004:15) highlighted another example of farmer innovation and pointed out that farmers in West Africa applied local knowledge to new technologies while adapting the practices to their local situations.

Despite the synergy from the research-farmer collaboration, the findings of the present study, and those of other authors (Rees *et al.* 2000; Rivera, Qamar and Mwandemere 2005:53) showed that linkages between researchers, farmers and other actors were weak. In a developed country context, Duram and Larson (2001:92) in the USA showed that researchers did not meet the needs of local organic farmers because the topics researched were different from the information farmers needed. The findings from developed and developing countries underpinned the importance of the new research model (Waters-Bayer and Van Veldhuizen 2005:4), which recognised linkages and collaboration with other actors such as the private sector, civil society and farmers. Reij and Waters-Bayer (2001a:5,11), observed that there were benefits where researchers, extensionists and farmers worked together as each actor had something to offer. Kamau’s (2007:144) study demonstrated synergy through research linkages between KARI, the Ministry of agriculture and farmers’ groups in

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<sup>78</sup> *Githomo* is a Kikuyu word meaning training.

other parts of Kenya. Collaborative research that included multiple actors facilitated learning to take place in multiple directions. While information on technologies was shared with farmers through training, demonstrations, field trials and extension services, researchers learned about local innovations from farmers. As summed by Llewellyn (2007:148), the main output of research is information, but the main outcome is learning.

The present study showed that research linkages were complex and involved multiple actors. However, only a few farmers had established research linkages with researchers, while the majority of farmers had not made contact with researchers. Making similar observations, Mchombu (2004:16) explained that researchers expected the few farmers with whom they worked to share information and knowledge they acquired with other community members. A study on the AKIS of Fiji showed that joint visits to farmers by research and extension were rare and that researchers often excluded farmers and extensionists from activities pertaining to the generation of technologies (Bachmann 2000:119-120). On their part, Kingiri and Ayele (2009:6) found that there were weak linkages between farmers and biotechnology innovations and institutions. The weak farmer–research linkages acted as barriers to accessing research outputs.

It was observed that farmers often adapted technologies passed on to them to suit their personal conditions and got discouraged when there was no follow-up or backstopping from research. The lack of follow-up and feedback observed by the present study thus stifled innovation. These findings suggest a need for collaboration between farmers, extensionists, researchers, the private sector and civil society actors and the need to listen to one another, learn from one another and most importantly to share research experiences. One strategy for improving access to information and knowledge included repackaging of information on research outputs for farmers.

Service linkages were important in the AKIS of small-scale farmers in Kirinyaga. The PRA tool – Service and opportunity map proved useful in assessing the agricultural services that were present and those who were missing but desirable. There were various service linkages in the district including plant and animal health service linkages, ploughing service linkages, irrigation service linkages, transport service linkages, soil sampling and analysis service linkages, input supply service linkages, credit service linkages, cooling service linkages, agroprocessing service linkages and others such as administrative and group development service linkages. Among the gaps identified by the present study were extension services, irrigation services, value addition services, market services, transport services and road infrastructure. Rees *et al.* (2000:4) and Rivera, Qamar and Mwandemere (2005:25,30,65) identified similar service linkages. These findings validated Röling’s (1988:32) assertion that it was “unfruitful ... to look at extension [or any other actor] in isolation from other

sub-systems,” and suggest the need to strengthen linkages between farmers and service providers in order to improve farmers’ productivity.

The present study indicates that other than the Ministry of Local Government, which provided market infrastructure, there were no market linkages with the public sector. This result was surprising, considering the important role played by the Ministry of Agriculture and Ministry of Livestock Development in collecting, synthesising and disseminating market information to agricultural stakeholders. This study showed that the key actors who provided market linkages in Kirinyaga district were mainly CSOs such as TechnoServe, and the private sector actors such as horticultural exporting companies and intermediaries, while cash crops such as coffee and tea were largely marketed through cooperatives and societies. Rees *et al.* (2000:4) confirmed the non-visibility of the Ministry of Agriculture and Ministry of Livestock Development in the market linkages. They showed that the main marketing linkages in Trans Nzoia district, Kenya were with traders and transporters, hawkers and the private sector, while the main linkages in Kiambu were cooperatives, private processing plants and traders. The present study and Rees *et al.*’s. (2000:4) have implications for the Ministry of Agriculture and Ministry of Livestock Development and suggest the need for heightening awareness of the services they offered to farmers (especially market information), and for developing communication strategies that ensured the information they repackaged and disseminated reached small-scale farmers.

Although there was a school of thought that perceived intermediaries to be exploitative, some farmers considered them crucial in the marketing of their produce. For example, traders and brokers played a key role in marketing the produce of farmers in Kirinyaga, especially those who collected produce at the farm gate. Farmers perceived brokers to be an important actor who helped to reduce the marketing chain by offloading the process of storage, packaging and transporting small quantities of produce to the market. A study carried out on the marketing of mandarins in Nepal established that farmers sold their produce through intermediaries to minimise transactional costs and risk of cheating in payment, as well as to reduce loss of income due to damage during transportation to markets (Pokhrel and Thapa 2007:156,160). Likewise research conducted between farmers of the Ezemvelo Farmers’ Organisation in South Africa and the market chain actors showed higher levels of commitment and cooperation where prices were stable (Darroch and Mushayanyama 2009:104).

Local markets such as Kutus, Kagio and Makutano played an important role in providing market linkages to farmers. Most farmers sought price information from, and sold their produce at local markets. Markets were also a social place for farmers and learning theatres where farmers exchanged ideas, information and knowledge. Farmers learned about new enterprises, varieties and breeds, markets and prices through their interactions and based on what they saw at the market from

other farmers, traders, transporters and suppliers. In New Zealand, “farmers’ markets” provided market outlets for smallholders and created value through cooperative activity. Through networking, farmers shared ideas, circumvented intermediaries, shared equipment, and attracted new traders through economies of scale (Lawson *et al.* 2008:12,19,20). The present study showed that dairy farmers had established linkages with milk processing plants such as the KCC, which enjoyed a monopoly for many years (since the 1920s). However, liberalisation of the dairy industry meant there were more than 27 milk processors including Brookside, which has now merged with Spin Knit, 64 mini dairies and 78 cottage industries (Kenya Dairy Board 2010). Despite the existing market linkages, farmers raised a number of barriers and constraints with the marketing sub-sector (see **section 12.2**). The present study endorses the conclusion by Klerkx and Leeuwis (2008:272) on mitigating against poor market prices and market failures in the agricultural sector. These findings suggest the need to develop supportive policies that help improve the flow of market information and the efficiency of the marketing chain.

Another type of linkage mechanism addressed basic human needs and spiritual needs. Farmers had basic need linkages to shelter, food, water, and health. Churches and mosques provided spiritual needs linkages and various types of church groups met together for prayers to satisfy their spiritual needs. Overall, the present study observed that most of the linkages between actors were weak and needed to be strengthened through formal agreements and institutionalisation. However, as discussed above, there were examples of synergy between actors. In such cases, strong linkages were demonstrated such as between Africa Harvest in providing TCB technology, the Ministries of Agriculture and Livestock Development in providing extension and training services linkages, and TechnoServe in providing market linkages (Munyua and Stilwell 2010:15). In addition, the establishment of linkages between different actors ensured the inclusion of, and contribution by disadvantaged groups that would otherwise have been excluded from the research-extension-education continuum. As the Kiswahili adage goes “*Umoja ni nguvu*” (unity is strength), and collaboration between agricultural actors through complementary linkage mechanisms improved service provision and agricultural productivity in general.

### **9.2.2 Assessment of linkages between actors**

Farmers’ groups cited the various linkages they had with associations, networks or stakeholders, and the benefits they derived from these associations such as training, access to markets, banking facilities and meeting basic needs (see **Appendix 78**). Data collected through linkage matrices (RAAKS) and using Venn diagrams (PRA) supplemented the results obtained through focus group discussions with farmers’ groups and interviews, questionnaires and observation. The Venn diagrams highlighted the diverse actors who farmers came in contact with and showed how close they were to the farmers. The linkage matrix data summarised the information obtained from most of the other methods in



tabular form (see **Appendix 79**). The symbol (x) denotes interactions or linkages between pairs of actors and numbers on the horizontal axis represent the actors on the vertical axis. The question mark (?) was used to express linkages that existed but were not stated, while the (-) denoted linkages that were not mentioned and probably did not exist. In general, there were linkages between most actors and the different categories of small-scale farmers. The many dashes and question marks between many pairs demonstrated that there were few linkages between actors. The network matrix showed that most actors linked directly to farmers and that there were few linkages between the different actors. Horizontal linkages between the same actors for example between NGOs, in different divisions or in the same division were weak. The linkage matrices for specific divisions are presented in **Appendix 79** to **Appendix 82**, and are discussed in **Appendix 83**.

An assessment of linkages between actors revealed that each division had established linkages with the key actors in that division based on the main enterprises produced and the actors that were available on the ground. Linkages between actors improved collaboration, cooperation and learning across all levels and among the different actors. These findings corroborated those of earlier authors (Pretty and Vodouhe 1997:50; Salomon and Engel 1997a; Kiplang'at and Ocholla 2005:245; Rivera 2006:59), who stressed the need for strong linkages between actors to facilitate the sharing, creating, storing, disseminating, integrating and use of knowledge and information in their specific areas of operation. For example, the present study established that KIFCO provided farmers with a central collection point that had facilities for sorting and grading their produce, weighing, and storage. KIFCO also negotiated for prices to abate exploitation of individual farmers by intermediaries. Likewise, Pokhrel and Thapa (2007:162) found that mandarin farmers in Nepal avoided being cheated and harassed by intermediaries by joining cooperatives, which helped to access better markets and prices.

The Sagana Venn diagram in Ndia division in Kirinyaga showed that chiefs and sub-chiefs provided useful service linkages. This finding concurred with results obtained by Bachmann (2000:107), who found that chiefs in Fijian villages were important in influencing uptake of technologies. In sum, the findings showed that linkages were essential in kneading together the components of AKIS, which played complementary roles in agricultural development (Eicher 1999:33), and suggest the need for collaboration and strengthening of linkages between actors.

### **9.2.3 Quality of relationships between key actors and small-scale farmers**

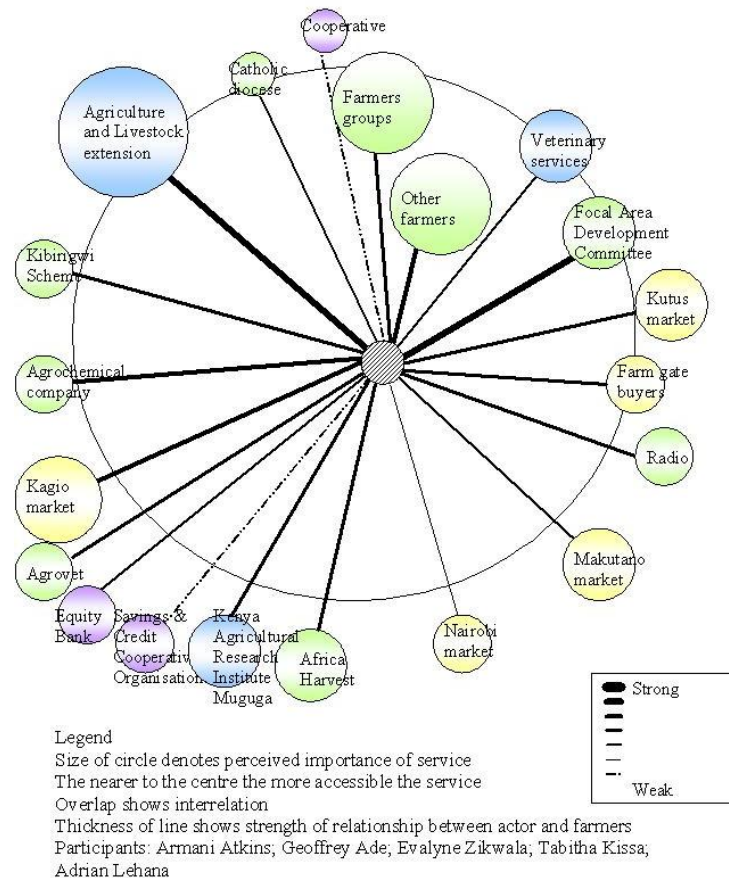
Although the linkage matrices and the Venn diagrams depicted linkages between actors (see **Appendix 84** to **Appendix 87**, they did not demonstrate the strength of their relationships with small-scale farmers. Network diagrams (PRA) were therefore used to supplement the findings presented above and to demonstrate the strength and quality of relationships between actors and frequencies of

interactions (see **section 5.5.1.2**). The network diagrams (see **Appendix 88** to **Appendix 100**) highlighted the key actors among the many listed on the linkage matrix. Despite the resemblance of data from Venn diagrams and network diagrams, the network diagram went beyond highlighting key actors who farmers came in contact with and how close they were to the farmer, and analysed the contacts in terms of their characteristics and quality of linkages, such as the strength of the relationship and functions they performed (Kumar 2002:211) with small-scale farmers. The network diagrams presented were produced by community members at a smaller sub unit (sub-location level) as opposed to the division level. This section presents and interprets findings on the quality of relationships between farmers and the key actors in the four divisions of Kirinyaga district. The study found that the importance and quality of actors varied from sub-location to sub-location.

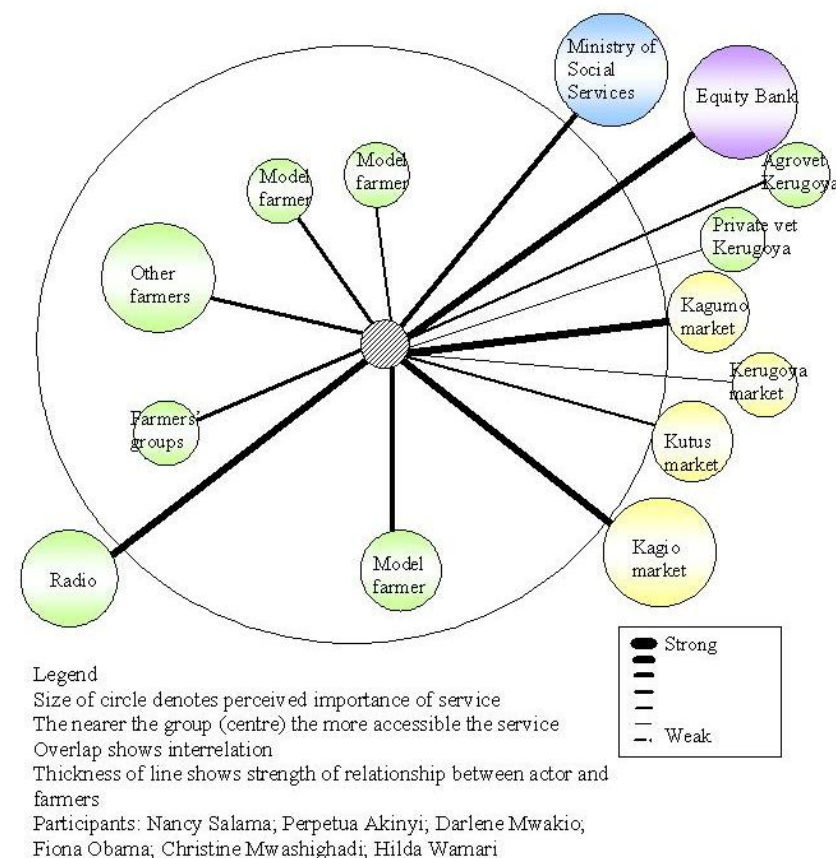
- The network diagram for Ngaru sub-location, Koroma location, Central division (see **Figure 41**) depicted the strength of a relationship by the thickness of the line showing the linkage. The network diagram for Ngaru identified 20 actors who interacted with farmers regularly. **Figure 41** and shows that extension, farmers' groups, markets, NGOs, traders, the private sector, research, NGOs and churches were perceived to be important actors. Agriculture and livestock extensionists were regularly in contact with farmers and were perceived to be very important because they were available in the community and were knowledgeable. In addition, they were experienced and their coverage of agricultural activities was broad and comprehensive. Although the FADCs (see **sections 6.3.1** and **9.3.3**) were perceived to have strong linkages with farmers, they were considered less important than extensionists because they did not reach many farmers and farmers' groups. On the other hand, neighbours, other farmers and Kagio market had strong information and knowledge seeking linkages with farmers. Neighbours were perceived to be next in importance in providing information and knowledge seeking linkages. Kagio market provided marketing linkages, and information and knowledge seeking linkages. This market was also considered important because of its proximity, convenience and accessibility in the community.
- Other linkages identified using the linkage matrix (arranged in order of strength of relationship as depicted by thickness of line) included KARI, Kutus market, Africa Harvest, agrochemical companies, media - radio, farm gate traders, KIFCO, agrochemical companies, and agrovets. Although these actors were assigned varying levels of importance, the quality of their relationships with farmers was uniform. The quality of relationship between farmers and Makutano market, private veterinarians, Equity bank and the Catholic diocese was more or less the same. There were linkages with Nairobi market but the quality of the relationship was not perceived to be strong, while the quality of linkages with cooperative societies was perceived to be weak.

Additional examples on quality of relationships in the Central and other divisions are presented in **Appendix 101**.

**Figure 41: Ngaru sub-location network diagram, Koroma location, Central division**



**Figure 42: Ndimi sub-location network diagram, Inoi location, Central division**





The present study, and previous studies (Den Biggelaar and Mugo 1996; Garforth 2001a; 2001b; 2001c; Rees *et al.* 2000:4; Stefano *et al.* 2005a; Karanja and Ouma 2006; Kiptot *et al.* 2006) showed that a good understanding of linkages was essential in planning for interventions to improve information flows and AKIS. The present study showed that the quality of relationship between the different actors and farmers varied depending on the division, location and sub-location; the enterprise produced; and the actors available in the various geographical units. For example, whereas extensionists were important and had strong linkages with farmers in Ngaru sub-location, Koroma location in Central division, they were perceived to be weak in Ndimi sub-location, Inoi location in the same division. In contrast, neighbours were perceived to be the most important actor, but with a weak relationship with farmers in Kianjanga sub-location, Mwerua location, Ndia while extension was the most important actor but with a weak relationship to farmers in Kithumbu sub-location in the same location and division. These findings confirmed those of earlier authors (Rees *et al.* 2000:2; Garforth 2001a), that AKISs were location specific. Likewise, Davis (2004:187,195) found that the location had an effect on linkages, marketing, and extension service linkages and communication networks.

There were benefits where the quality of relationship between actors was strong. The present study showed that KIFCO had a good relationship with farmers in Ndia division because it provided a central collection and marketing point. Linked to the strong linkages of farmers to KIFCO, the study established quality extension service linkages between farmers and extension in some localities. Extensionists were perceived to be important actors who were knowledgeable and provided comprehensive information. Despite their being overstretched and not available when needed, extension emerged the most important source of information for small-scale farmers in Kirinyaga district (Munyua and Stilwell 2010:15). In contrast, Dutta's (2009:49) review of the literature of developing countries indicated that extensionists were not heavily relied upon because some were not qualified and were not knowledgeable on modern farming techniques.

The present study showed that some horticultural exporting companies did not have good relations with farmers because they drew contracts that favoured their firms and exploited farmers. Renko, Nikolasevic and Pavicic (2002:543) noted these challenges in Croatia and emphasised the need for involving all actors in the marketing chain (including disadvantaged farmers) in the drafting of contracts. The present study supported the suggestion on inclusivity, which point to the need for re-drawing new contracts between horticultural exporters and farmers, which incorporate the views of all key stakeholders in the horticulture industry.

#### 9.2.4 The importance of actors and the influence of lead actors

Soft systems approach (Checkland 1988; 1999; 2000; Checkland and Scholes 1990) (see **section 3.2.1.1.**), and the RAAKS methodology (see **section 5.5.1.1**), guided the processes of identifying key actors and potential actors, identifying opportunities to improve knowledge and information system. The RAAKS methodology also helped to create awareness of the strengths and weaknesses of actors and opportunities to improve the AKIS among relevant stakeholders. While the inventory of key actors in Kirinyaga district is long and one cannot tell at district level which actors were more influential or how important they were (see **Appendix 77**), an analysis of actors at sub-location level and the activities they carried out helped to identify the levels of importance and influence that each actor commanded in the sub-industry of each enterprise. Considering the wide range of enterprises produced in the district, and the varied agroecological conditions in the four divisions, and the diverse needs for information, the key actors were identified based on specific enterprises produced as opposed to broad farming activities in the sub-locations.

Communication networks (RAAKS) (see **section 5.5.1.1**) based on the enterprises produced showed the relevance of actors in providing agricultural information and knowledge linked to the production of a particular enterprise by small-scale farmers in the district. The closer the circle was to the centre in the communication network diagrams, the nearer it was perceived to be to the farmers and the more relevant the actor was perceived to be. Prime mover septagrams (RAAKS) or the spider web helped to clarify and visualise the influence or leadership specific actors provided in the operational activities of farmers. The score on the Prime mover septagram indicated how influential the actor was in the sub-sector and the higher the number (maximum of five) the stronger the influence or leadership role, and the lower the score (minimum of one) the weaker the influence (see **Appendix 102 to Appendix 115**). Differences were observed within enterprises in different locations and sub-locations depending on the actors who were present in the area, the agroecological conditions and the enterprise(s) produced. This section presents brief justifications for the choice of seven enterprises and examples of important and influential actors for two enterprises in Central division. **Appendix 116** presents and discusses findings on the other enterprises produced at group or sub-location levels in the other divisions.

- i) *Bee keeping* – all the four divisions had appropriate agroecological conditions for bee keeping and the production of honey. Honey in Kirinyaga district was previously used for making a traditional alcoholic beverage that was mixed with medicinal plant parts such as tree bark, roots and leaves (“*miti*”), and the brew was perceived to have medicinal properties. However, as the commercial value and market for honey, as well as the availability of information and knowledge about bee keeping improved, many farmers’ groups and individual farmers in the

drier lowland and high potential areas adopted the production of honey as a commercial enterprise.

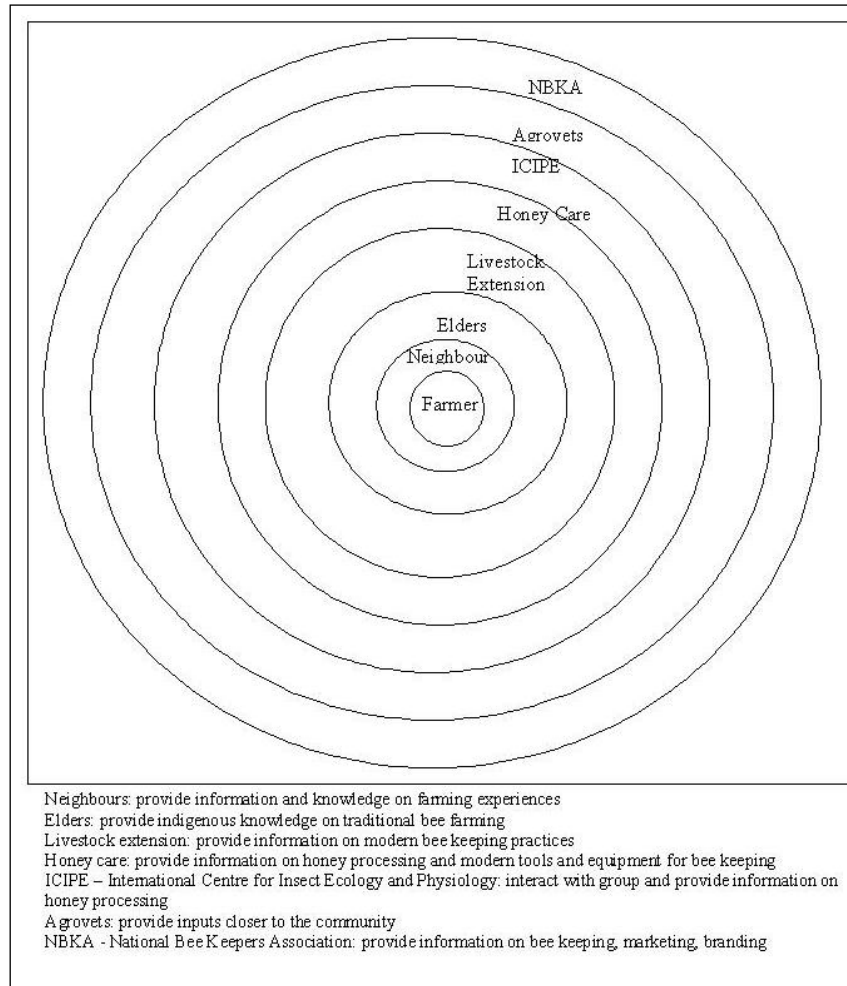
- ii) *Dairy goats* – As mentioned in **section 2.3.1.3**, land size is a critical constraint in most parts of Kirinyaga district, and the small pieces of land have to sustain both crops and animals. Dairy goat husbandry was attractive to many groups and had been widely adopted in the district because unlike cows, goats did not need much space, feed and management. Besides, there was high demand for goats' milk because of its nutritional values and medicinal properties. Most of the milk was consumed at household level and any surplus was sold.
- iii) *Cotton* – was an important enterprise for Mwea division because of its agroecological and climatic conditions. The GoK had also developed a new policy aimed at reviving the cotton sub-industry (see **section 2.2.6**). To meet the rising interest in growing cotton, a new cotton variety was introduced and farmers who had previously abandoned cotton farming due to low yields and poor profits were encouraged to produce rain-fed or irrigated cotton.
- iv) *Horticulture* – all the four divisions in Kirinyaga district produced a wide range of rain-fed and irrigated horticultural crops (fruits, vegetables, and flowers) for the local and export market. Many groups stated that they adopted the growing of horticultural enterprises because: there was a ready domestic and export market; the enterprise earned them good income; and some horticultural crops took a short period to mature and this meant that there was a quick turnover and more crop cycles per year. These factors made the enterprise attractive to all types of groups, especially the youth who did not own land but could lease land, produce and sell.
- v) *Rabbits* – there has been increased awareness of rabbit production because of their rapid multiplication and their nutritious and economic value as a good and cheap source of protein and other by-products. The requirements of the enterprise in terms of capital outlay were also minimal. The Ministry of Agriculture through the NALEP programme and the Njaa Marufuku Kenya project encouraged farmers' groups to adopt the production of rabbits to alleviate poverty and ensure food security.
- vi) *Poultry* – was an important enterprise especially in the drier parts of the district - in Mwea and Ndia divisions, where a number of groups had adopted the enterprise because of the high demand for poultry meat and eggs. Poultry production was attractive because the enterprise did not require much land, labour or investment. A number of groups had thus adopted the production of poultry for meat or eggs.
- vii) *Tree seedlings* – most farmers in Kirinyaga district planted multipurpose trees such as *Grevillea robusta*, Croton and Eucalyptus for various reasons including soil and water conservation, wind breaks, building poles, fuelwood, conserving the environment and for aesthetic value. A number of groups had established tree and fruit tree nurseries (indigenous and exotic trees) to provide seedlings to institutions and the community.

In Central division, the production of honey and dairy goats were selected to demonstrate the importance of key actors and the influence they exerted in the industries of the two enterprises.

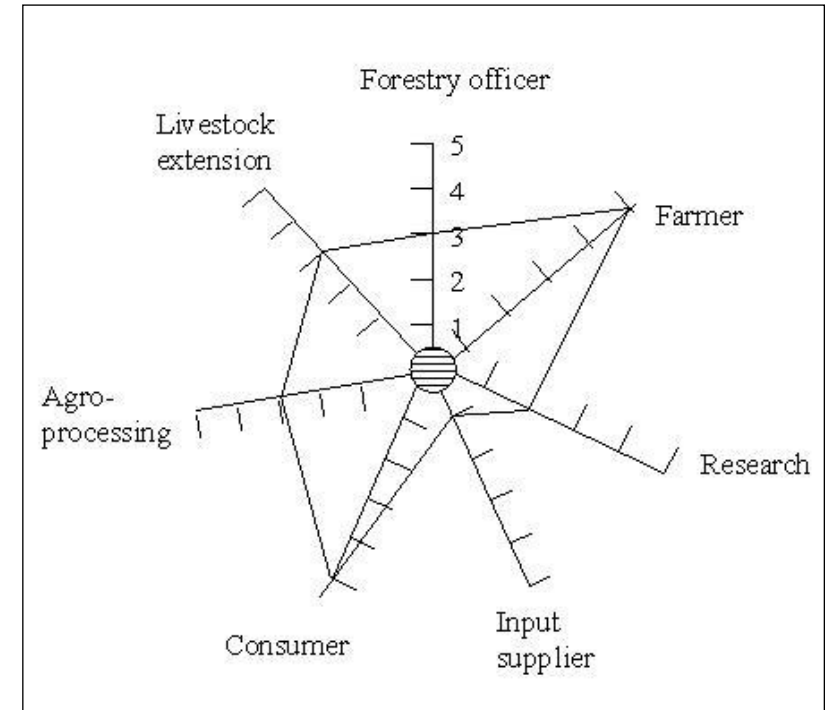
*Bee keeping enterprise*

- i) The communication network of the Gitaaraga bee keeping group in Kariko sub-location, Inoi location in Central division (see **Figure 43**) depicts the key actors in the bee farming sub-industry and their relative importance. Farmers perceived neighbours as the key source of information and knowledge based on their experience and proximity, followed by elders who had experience and local knowledge on traditional bee farming. Livestock extension was depicted as third in importance because they provided advice and information on modern tools and equipment but were not readily available. Honey Care Africa (a private company) was ranked fourth and provided information on honey processing, modern tools and equipment and guaranteed market by collecting produce from farmers at the farm gate. ICIPE was ranked fifth because they provided information on honey processing but were geographically distant and not easily accessible. Agrovets came sixth in importance because they provided inputs, followed by the National Bee Keepers Association (NBKA), which provided information on bee keeping, marketing and branding.
- ii) The Prime mover septagram of the Gitaaraga bee keepers group in Kariko sub-location, Inoi location, Central division (see **Figure 44**) indicated that on a day-to-day basis, the most influential actors (prime movers) in the lives of bee keeping farmers were other farmers and consumers (maximum score of 5 showing strongest influence). The forestry officer, livestock extension officers and agro-processors were moderately influential (score of 3). Research was less influential (score of 2), while input suppliers were still less influential (score of 1).

**Figure 43: Communication network of Gitaaraga bee keeping group, Kariko sub-location, Inoi location, Central division**



**Figure 44: Prime mover septagram of Gitaaraga bee keeping group, Kariko sub-location, Inoi location, Central division**



### *Dairy goat enterprise*

- i) The communication network for the Kanduga dairy goat self help group in Karia sub-location, Koroma location (see **Appendix 102**) depicted the relative importance of actors in the dairy goat sub-industry. Farmers perceived neighbours who were in close proximity to be the most important actor as they provided prompt information and knowledge on goat rearing promptly. Second in importance were other farmers rearing dairy goats (not belonging to a group and not in the neighbourhood), who shared their experience and knowledge on dairy goat husbandry. The DGAK officers came third, and were considered knowledgeable but were not resident in the community and had to be called in when needed. DGAK provided farmers with the breeding stock (Alpine or Toggenburg bucks and kids), training and information, as well as market for the improved kids and dairy goats. However, the fee charged for service was perceived to be too high hence some farmers' groups, only called the DGAK officials when it was absolutely necessary or when they could afford to pay. Livestock extensionists came fourth, and provided information and advice on dairy goat husbandry, but were often not available, hence had to make appointments based on their availability. The extensionists were too few and had to cover large areas and many farmers' groups hence were overstretched. Private veterinary clinicians followed in fifth position and provided information on breeding, dairy goat husbandry and diagnosis and treatment of goat diseases. However, the fee for service was perceived to be expensive hence farmers called the veterinary clinicians as a last intervention or following recommendation of the DGAK or livestock extension officers. Agrovets were rated sixth in importance because they provided inputs such as recommended drugs for goats such as de-wormers. Farmers perceived agrovets to be expensive and some members of the RAAKS team did not consider some of the information obtained from some agrovets to be reliable because they focused more on promoting and selling what they stocked.
- ii) The Prime mover septagram for Kandunga dairy goat keeping group in Karia sub-location (see **Appendix 103**) depicted consumers as the prime mover actors (5) in the daily operations of dairy goat farmers, while livestock extension and the DGAK were next (4). Input suppliers were less influential (2), while research, farmers and agro-processors were perceived to be less influential (1).

The Soft systems methodology (Checkland 1988; 1999; 2000; Checkland and Scholes 1990) (see **section 3.2.1.1.2**), and the RAAKS methodology (see **section 5.5.1.1**), guided understanding and interpretation of the findings on actors who were perceived to be important and influential. The soft systems perspective helped to explain the role of each important actor, what they did and how they shared ideas, experiences, knowledge and information. The study findings suggest a need for synergy

and collaboration by key actors in the different locations. As pointed out by Röling and Wagemakers (1998:16,17), each actor had useful knowledge and information assets to share that could contribute towards the common problem through collective learning. The soft systems methodology helped to raise awareness of the roles that different actors played in the different sub-industries and point to areas for improvement. This methodology also provided an approach for learning, solving problems, and innovation.

Rees *et al.* (2000:14) emphasised the importance of availability of information providers and pointed out that farmers learned through direct interaction with researchers who worked with them. The present study showed variations in the actors that were prime movers in different enterprises and geographic locations. While the Maarifa self help group depicted farmers' groups and Fineline as the most influential actors in the horticulture sub-industry in Gichugu division, Minten, Randrianarison and Swinnen (2009:11732-733) found that in Madagascar, global retail companies such as Lecofruit were the prime movers through foreign direct investment. Lecofruit provided inputs on credit, advisory and supervision services to ensure adherence to phytosanitary standards and a ready market (see **section 6.3.1.7**).

Further, the findings of the present study showed that local (actors available on the ground) as opposed to external actors were the most important sources of agricultural information and knowledge in all the four divisions. For example, consumers were rated the most influential actor in the operational activities of farmers in the dairy goat enterprise in Karia sub-location in Central location, while Fineline, which had representatives at the grassroots was considered the prime mover for the horticulture enterprise sub-industry in Kabari sub-location in Gichugu division. In Gathiga sub-location in Mwea division, neighbours emerged the most influential actors because of their proximity and willingness to share information and knowledge assets they had on horticultural production. In Kianjan'ga sub-location in Ndia division, policy makers and youth groups were the most influential actors for the tree and fruit tree seedlings nursery enterprise sub-industry. These findings suggest a need for identifying the important and prime mover actors in an AKIS, strengthening the weak ones and establishing linkages with potential actors that were not represented in the AKIS.

### **9.3 Flows of information and knowledge between actors**

This section aimed to answer the **research question 3.2: *How does information and knowledge flow between the key stakeholders? (Social ecology of groups)***. Effects resulting from the actions of important actors and their influence as prime movers in the various sub-industries presented above can best be realised if the linkages provided facilitate the flow of information and knowledge to the intended users. As explained in **section 4.7.3.2**, the flow of information and knowledge between actors is of

prime importance in the AKIS of Kirinyaga district. Results from the linkage matrices presented in **section 9.2** showed that agricultural information and knowledge mainly flowed horizontally and there were a few vertical linkages between pairs of actors. In most cases, the linkages were direct from the different key actors to the farmers. Results from interviews with key informants at community level indicated that some information flowed through intermediaries such as extensionists and NGOs through channels such as training, demonstrations, field days, and study tours.

Within the community, there were various local networks through which agricultural information and knowledge flowed (see **section 9.1.11**). Some information flowed from elders in the community to farmers and other actors, from farmer-to-farmer and among group members. In the district, information flowed at various levels including district, division, location and sub-location, and at each level, different actors played a role in the sharing and dissemination of information and knowledge. Some information flowed horizontally from farmer-to-farmer, some vertically from research to farmers, while as mentioned above some flowed through intermediaries. Extension for example played a vital role in facilitating the flow of information, but because of their small numbers, the extensionists could not meet the demand for service. This gap opened up opportunities for the private sector and civil society actors to render agricultural information and knowledge services to farmers. As mentioned in **section 9.1.11**, there were formal and informal local groupings and networks that facilitated the flow of information at the various levels such as the stakeholder fora, associations, committees, farmers' groups, as well as other types of social networks such as religious congregations and social welfare groups.

The use of information and creation of value was determined by the flow and exchange of information (Powell 2003:45). Meert *et al.* (2005:94) pointed out that farmers who diversified their activities participated in varied associations and social networks to facilitate the flow of information and knowledge. As presented in **section 6.5**, farmers in Kirinyaga district produced more than 56 enterprises, and accessed and shared information on the entire marketing chain from different actors. The findings of the present study indicate that information flowed vertically across actors while some flowed horizontally within a given actor. These findings were consistent with those of other authors (Pinard 1996; Rees *et al.* 2000:3; Meert *et al.* 2005:94), who found that most linkages were horizontal. These findings suggest a need to strengthen vertical and horizontal linkages to improve the flow of agricultural information and knowledge within the AKIS to facilitate decision making, problem solving, innovation and collaborative learning.



### 9.3.1 Information flow through public extension services

The present study established that agricultural information mainly flowed through the hierarchical structure of the Ministry of Agriculture, and the Ministry of Livestock Development and Ministry of Fisheries Development. At district, division, location and sub-location levels, the Ministry of Agriculture and the Ministry of Livestock Development had mechanisms that facilitated the flow of information and knowledge. Findings from interviews with government informants indicated that agricultural information and knowledge mainly flowed two-ways from the Ministry of Agriculture and Ministry of Livestock Development district headquarters, through the DAO or District Livestock Officer (DLO), and through specialised officers in-charge of the major enterprises and farming systems in the district. For example at the Kirinyaga district headquarters, there was an agribusiness officer, home economics officer, crops officer, horticultural officer and soil and water conservation officer, and a livestock officer who worked closely with the divisional agricultural / livestock extension officers. At divisional level, there were specialised extension officers who worked closely with the divisional heads to meet the needs of farmers in the division. Below the divisions, there were FEOs, who were allocated specific locations and sub-locations. Some locations had only one staff member while others had more and some of the locations were very large. The FEOs were not provided with means of transport to cover the large areas they covered in their locations hence commuted on foot, personal transport such as motor bikes, bicycles or public transport “*matatu*<sup>79</sup>” at their own expense. Information also flowed up from farmers through the FEOs to the divisional heads, who fed information up to the DAO / the DLO.

The findings of the present study were similar to Bachmann’s (2000:124,172) who observed that in Fiji, agricultural information flowed two-way from the Ministry of Agriculture, Fisheries, Forests to farmers and *vice versa*. The findings of the present study showed a low number of extension officers at location and sub-location levels covering large areas and with no means of transport. This lack of transport for the FEOs was a key barrier to the flow of information to small-scale farmers in Kirinyaga. This finding pointed to the need to increase the number of FEOs and to facilitate their travel within their areas of jurisdiction (allowance or means of transport). This would enable them to reach more farmers and farmers’ groups.

### 9.3.2 Information flow through the stakeholder forum

Efforts to improve linkages between different actors led to the formation of a stakeholder forum that comprised agricultural stakeholders from the public sector, the private sector, CSOs and farmers representatives. The forum members met regularly to plan, share and exchange information. The forum had facilitated joint field days and other activities circulated copies of their minutes to all members, who in turn shared the information with their clientele and community networks. The

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<sup>79</sup> Matatu – a Kiswahili word commonly used in Kenya for mini buses offering public transport.

Ministry of Agriculture assumed leadership and coordination of the forum. However, some informants pointed out challenges with the forum including lack of commitment, low levels of attendance and inadequate financial resources to implement planned activities.

The members of the Kirinyaga stakeholders' forum contributed to the agricultural sector in Kirinyaga district through a few joint activities that demonstrated synergy and benefits to individual stakeholders and to farmers. As pointed out by Röling (1989:2), the synergy of the various components contributed to the whole AKIS, resulting in benefits that were higher than the sum of each component. Leadership of the forum was crucial to the sustainability of the forum, and while the Ministry of Agriculture provided leadership of the Kirinyaga stakeholder forum. Results from a study conducted in Fiji indicated that researchers perceived the private sector to be best placed to lead the platform, while extensionists preferred that experts lead the platform (Bachmann 2000:177). The findings on challenges experienced by the forum suggest a need to formalise the stakeholder forum and to provide the forum with appropriate resources. The study findings suggest the need for the development of a national agricultural information policy that places more value on agricultural information and the sharing and exchange of information between actors.

### **9.3.3 Information flow through the Focal Area Development Committee (FADC)**

There were FADCs at various levels (district, location and sub-location) that provided linkages between farmers and the Ministry of Agriculture and the Ministry of Livestock Development extension and other stakeholders in the community. The FADC members were often the first adopters of new technologies and good agricultural practices, and were expected to demonstrate the same to neighbours and other community members in their focal areas. The FADC members met regularly to share and exchange information and knowledge, challenges and opportunities, which they shared with their catchment community. Discussions with the NALEP programme coordinator indicated that the FADCs had adopted affirmative action as a policy with regard to gender and one third of the committee members were female. This action ensured gender inclusion at decision making level.

### **9.3.4 Information flow through common interest groups (CIGs)**

The NALEP programme and the Njaa Marufuku Kenya project encouraged the formation of CIGs in the community (see sections 2.2.4.2 and 6.3.1). The CIGs provided mechanisms for the flow of information and knowledge on agricultural related issues, development and social activities to rural communities, and provided linkages to other agricultural actors.

### 9.3.5 Information flow through farmers' groups

Interviews with key informants and findings from focus group discussions with farmers' groups showed that information in farmers' groups flowed from group leaders to members and from members to other group members. Information also flowed from various information providers that worked through farmers' groups and knowledgeable members of the groups through training, extension, demonstration and field trials. Results from farmers' groups showed that information flowed from one member of the group or actor to other members of the community, family members, friends and other actors in the community. FFS were special types of groups that were useful for sharing agricultural related information and knowledge. Members of the FFS shared what they knew with peers and with facilitators, and shared what they learned through their "networks of affiliation" (personal social and family networks, for example family, relatives, clan, friends, religious groups, social groups, committees and associations).

The social ecology concept provided an approach to understanding and explaining information flows in groups such as FADC, CIGs, Farmers' groups, "Community parliaments" and other social and community networks. The social ecology approach emphasised the perceptions of individual farmers within the environment at multiple levels and the interactions between people and their surrounding social environment. The approach places emphasis on the role of individuals, groups and institutions in the flow of information, and their collaborative efforts in improving agricultural production and their cumulative impact on community (Binder 1972; Stokols 1996; Dimara, Petrou and Skurus 2003:222).

As discussed in **section 9.2**, farmers' groups were important actors and provided a mechanism for the flow of agricultural information to other farmers and actors within the AKIS. For example, the FFSs were useful networks that had i) facilitated establishment of linkages between agricultural technology developers and farmers; ii) strengthened weak research-extension linkages; and iii) improved the sharing of farmers' expert knowledge (Onduru *et al.* 2002). The study by Tchawa, Jean-Baptiste and Bonneau's (2001:25) in Cameroon revealed that farmers' groups stimulated and facilitated exchange of experiences on improved farming systems. A survey evaluating the Landcare groups in Australia also showed that groups played a catalytic role in rural development and had attracted and helped to improve communication among landholders, learning through interaction, access to resources, and the building of social capital (Curtis and Cooke 2006:5,16-19,20,36). Findings of a case study carried out by Gianatti and Carmody (2007:166-171) in Australia revealed that grower groups were working with other community based farming systems groups, researchers and the private sector to form partnerships. These partnerships led to the development of complex networks that contributed to improved flow of information, underpinning the social ecology approach.

Partnerships enhanced access to research outputs and current information (Gianatti and Carmody 2007:166-171). As discussed in **section 4.5.7**, farmers groups provided access to group training and improved access to knowledge and information on new technologies and improved farming practices (Meyer 2000:154; Muriuki *et al.* 2003:71; Curtis and Cooke 2006; Galindo 2007), offered a wider reach to farmers (Petersen 1997) and improved flows of information and knowledge (Petersen 1997). Furthermore, the participatory approach through groups facilitated joint action-based learning (Moussa 2006; Opondo *et al.* 2006). The information and knowledge shared increased the adoption of high value commodities and the diversification of enterprises (Mishra and Swanson 2009:339,341). In sum, the findings of the present study and those of other authors showed that farmers' groups facilitated the flow of agricultural information and knowledge and suggest the need for further research in social ecology of information.

### **9.3.6 Information flow through other social and community networks**

Examples of social and community networks that the study found in Kirinyaga district included barazas, WUAs, cattle dip committees, Muungano Umbrella Group in Gichugu, the Mwea Rice Growers and Millers (MRGM) and "Community parliaments."

- Community leaders and elders shared relevant agricultural information and knowledge with community members and group leaders in social and public gatherings such as barazas, which were held at different administrative levels. For example, the chief held frequent barazas to share administrative and development information with community members. At each baraza, community leaders were given an opportunity to share development information. Barazas (chief's and other forms of barazas) were an effective linkage mechanism that facilitated the flow of agricultural information to farmers and were a good entry point for sharing information and knowledge. However, some informants pointed out that the barazas were not frequent and attendance was low.
- The Muungano Umbrella group in Gichugu division, which comprised leaders from 11 tree planting groups met regularly to plan and exchange information and knowledge. Information flowed from the umbrella group through its leaders, and was then conveyed to group members. The group members in turn shared information with their social and family networks.
- In Mwea division, there were "Community parliaments," which provided a mechanism for information flow and for addressing the needs of community. "Community parliaments" provided a platform for sharing and exchanging agricultural information and knowledge, and operated on a similar concept to that of network marketing. "Community parliaments" were legal entities that facilitated joint planning, defining of community needs and seeking solutions to common problems with relevant stakeholders from other development sectors. Information and knowledge received at the top level flowed down the hierarchy to group leaders, group members and to other community members. Information flow was two way and flowed from the

community up to the top body through their group leaders. “Community parliaments” also linked farmers to other relevant actors such as sources of credit, inputs, markets and information providers.

- The WUAs (supported by the NIB) facilitated communities to manage irrigation and enforced rules and regulations on efficient water use. The WUAs acted as linkage mechanisms that facilitated the flow of information from the NIB to members of WUA and from the members to management on matters pertaining to irrigation and the management of water.
- The MRGM is a farmers’ association that offers milling services to farmers in the rice paddies. Information on rice milling flowed two-way from the management of MRGM to rice farmers and from farmers to the MRGM management.
- Data collected through timelines (PRA) indicated that land in Kirinyaga district was allocated to clans, who decided on further sub-divisions to clan members. Some clans and families had formed groups that met regularly to plan and share information and knowledge pertaining to a wide range of development and agricultural activities (see **Appendix 117**). Such clans or families had established strong linkage mechanisms that facilitated the flow of agricultural information and knowledge from the elders down to clan members.
- Agricultural information and knowledge flowed through churches and other faith-based groups from leaders and experts to congregations and communities they worked with. Information flowed through announcements made on Sundays, notice boards in church compounds, training and outreach activities in the community. There were many denominations of churches in Kirinyaga that were active in development activities (including agriculture) with community members such as the Anglican and Catholic churches and church related NGOs such as CCS and CRS. The mosques also shared development and agricultural information with their congregations through announcements made after their prayer meetings on Fridays and other days.
- Findings from interviews with patrons and members of 4-K clubs in primary schools demonstrated that agricultural information flowed through local institutions in the community such as schools. Pupils shared agricultural information that they learned in school (science lessons and 4-K clubs) with family members, neighbours and friends (see **section 6.3.1**). Information also flowed through other community institutions such as dispensaries, clinics, colleges and markets.
- Results from interviews with farmers established that local knowledge flowed from knowledgeable elders in the community to family members or group members or experts and to any member of the community who asked.

The finding on self governing social networks sharing a common interest and objectives such as the cattle dip committees, Muungano group and “Community parliaments” could be equated to CoPs

that shared valuable agricultural information and knowledge. As pointed out by Davenport and Prusak (2000:38-39), group members often had complementary knowledge assets that were shared through interactions, which contributed to problem solving. As recommended by Davenport and Prusak (2000) in the context of organisations, CoPs were assets to communities hence needed to be encouraged. CoPs were assets and invaluable in farming communities in Kirinyaga district, where there were many farmers' groups, CIGs, FADCs, committees and associations.

With regard to the structure of "Community parliaments," Meyer (2000:154) observed a similar network pattern with the farmers groups in Phokoane in South Africa, where leaders who had been trained were asked to form their own groups of community members in the vicinity that were interested in learning about maize production. The new groups then voted in their chairperson and committee members (two had to be women). The relationships with other external actors depicted a type of social capital where groups linked vertically to external actors (Pretty and Wesseler 2003:5) and horizontally to other group members. The finding on barazas being rare corroborated that of Davis (2004:184). Davis (2004) suggested the need to improve the image of barazas by strengthening the local administration through good leadership and performance contracts. The present study concurred with this suggestion because barazas had a wide community reach as diverse members of the community attended them, who further shared the information with their social networks.

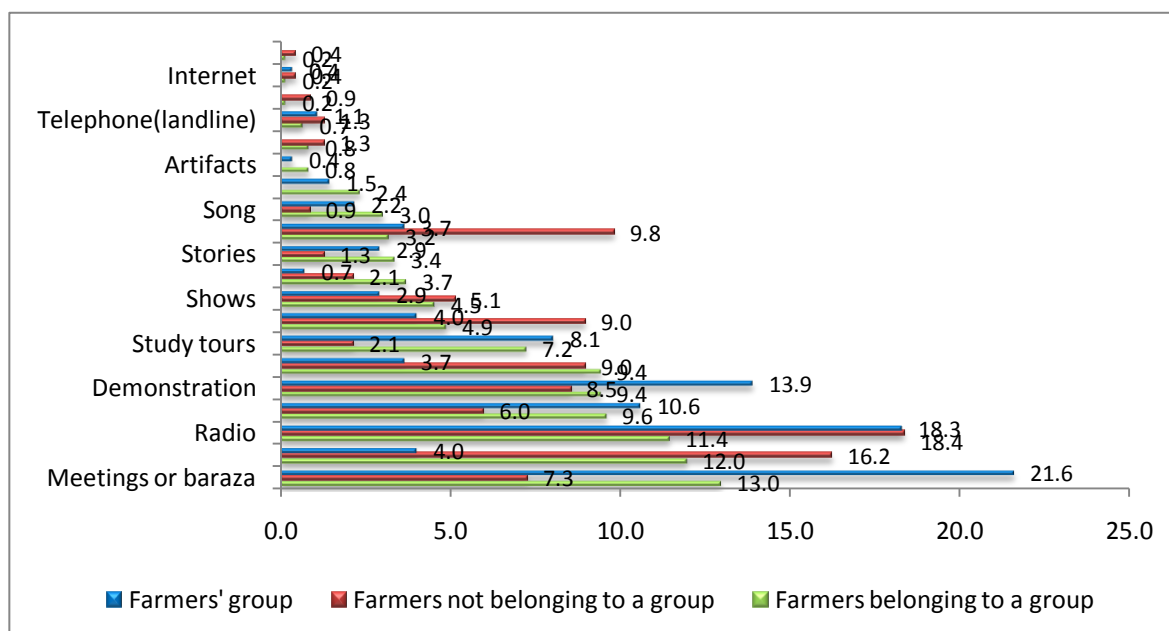
#### **9.4 Communication channels for accessing and sharing agricultural information**

Communication channels are powerful tools for enhancing the flow of information and knowledge. This section aimed to answer the **research question 3.4: *What communication media do actors (including farmers / farmers' groups) use (men, women and the youth)?*** Aspects of the Knowledge and information system (KIS) perspective described in **section 3.2.1.1**, which is embedded in the Systems perspective helped to explain the communication channels used. The KIS perspective recognised that all actors generated, transformed, transmitted, integrated, disseminated and used knowledge and information to some extent (Röling 1988; 1989; Engel 1995; 1997:23,31; Salomon and Engel 1997a:19), and recognised communication as a form of social interaction (Engel and Salomon 1997).

##### **9.4.1 Main communication methods used in accessing and sharing agricultural information**

**Figure 45** presents the main communication methods used by the different categories of farmers for accessing and sharing agricultural information and knowledge.





**Figure 45: Communication methods used for capturing and sharing information and knowledge**  
N=73 for farmers' groups, N=92 for farmers belonging to a group and N=65 for farmers not belonging to a group

#### 9.4.1.1 Communication methods used by farmers' groups in accessing and sharing agricultural information

The main communication methods used by farmers' groups (N=73, 273 responses) to capture and share agricultural information and knowledge (external, local) were: i) meetings or barazas (59, 21.6%), ii) radio (50, 18.3%), iii) demonstrations (38, 13.9%), iv) exchange visits (29, 10.6%) and v) study tours (22, 8.1%). Other important methods included TV, shows, cellular phones, song, stories, landline telephone, drama, print, artefacts and internet. It was observed that only one informant used the internet to access and share knowledge (see **Figure 45**).

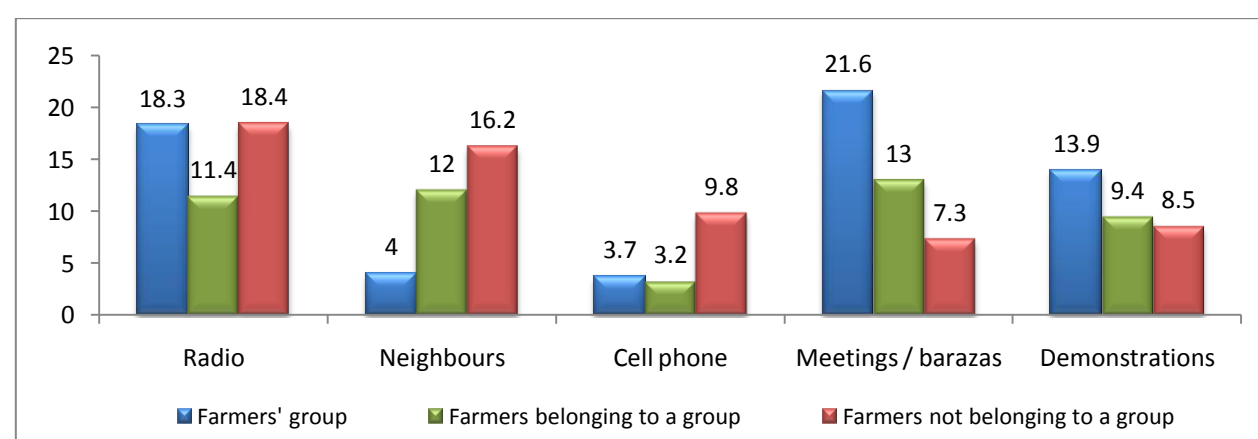
#### 9.4.1.2 Communication methods used by individual farmers in accessing and sharing agricultural information

The main communication methods used by farmers belonging to a group (N=92), i) were meetings or barazas (77, 13%), ii) neighbours (71, 12%) and iii) radio (68, 11.4%). Only 1 (0.2%) informant used the internet, and very few used the cellular phones. Other notable sources included exchange visits, demonstrations, word of mouth, study tours, TV, shows, print, song, cellular phone, drama, artefacts, landline phones and WorldSpace radio (see **Figure 45**). Farmers who could not read obtained assistance from group members or family members, who read and explained the contents to them. Farmers not belonging to a group (N=65) mainly used i) radio (43, 18.4%), ii) neighbours (38, 16.2%) and iii) cellular phone (23, 9.8%). Other important sources are presented in **Figure 45**.

### 9.4.1.3 Comparison of communication methods used by groups and individual farmers in accessing and sharing agricultural information

A comparison of the three categories of informants (farmers' groups, farmers belonging and farmers not belonging to a group) revealed that informants used both the traditional (drama, stories and song) and modern communication methods (internet, cellular phones and the personal digital assistant (PDA) (one informant) (see **section 4.7.3.2**). The findings showed that there were more farmers belonging to a group who used oral interpersonal communication channels such as meetings, barazas, word of mouth, drama and stories, exchange visits, demonstrations and study tours than farmers not belonging to a group. There were more farmers who accessed and shared information and knowledge through neighbours and cellular phones among the category of farmers not belonging to a group than was the case with farmers belonging to a group and farmers' groups (see **Figure 45** above). Results of the study showed that there was little usage of print materials (0.7%% for farmers' groups, 3.7% for farmers belonging to a group and 2.1% for farmers not belonging to a group). The findings indicated that farmers preferred audio and visual channels to print materials.

A scrutiny of the top three communication methods used by each category of informants showed that farmers' groups used oral and practical communication methods comprising meetings / barazas and demonstrations for sharing agricultural information and knowledge much more than farmers belonging to a group and farmers not belonging to a group (see **Figure 46**). Although the findings suggest that there were as many farmers belonging to a group as farmers' groups who listened to the radio, the farmers' groups acknowledged that they listened to the radio individually and not as a group. Farmers not belonging to a group used the cellular phone for accessing and sharing information much more than farmers' groups and farmers belonging to a group.



**Figure 46: The top three communication methods used by small-scale farmers for capturing and sharing information and knowledge**

N=73 for farmers' groups, N=92 for farmers belonging to a group and N=65 for farmers not belonging to a group



As described in **sections 4.7.3.2**, farmers used traditional and modern communication channels for accessing or sharing agricultural information and knowledge. The findings of the present study indicate that the key communication methods used for sharing and exchanging agricultural information and knowledge were largely oral (meetings and demonstrations). These findings were consistent with the work of earlier authors (Kiondo 1998:212) in Tanzania, Tshikolomo (1998:25-26) and Leach (2001a:57) in South Africa, (Byamugisha *et al.* 2008:98) in Uganda and Kanté *et al.* (2009:288) in Mali. Kiondo (1998:212) found that rural women largely used oral inter-personal communication channels, followed by posters, village meetings, group discussions, traditional media such as song and dance, as well as demonstrations. Tshikolomo (1998:25-26) established that most fruit farmers in the Northern province of South Africa obtained agricultural information through demonstrations. Confirming these findings, a study on the effect of communication channels and authority on group decision processes and outcomes by Barkhi *et al.* (1998:224) showed that groups that used face-to-face communication channels had better performance in terms of the outcomes of decisions made than groups that used computer-mediated communication channels. The present study found that although traditional communication channels were effective, their usage was low. Noordin *et al.* (2001:515) pointed out that traditional communication channels were not commonly used because they benefitted only a few farmers and hence were not cost effective. Besides, traditional communication channels such as drama were expensive.

The findings of the present study and those of other authors (Meyer 2000; McClelland, Gartmann and Van Rees 2004:9) established that group communication methods such as group meetings or field schools were more cost-effective in communicating agricultural information than methods targeting individual farmer. Momodu's (2002:409) study in Nigeria identified the key communication channels used by small-scale farmers as extension services through demonstrations and farm experiments, community development programmes, cooperatives, youth organisations, women's market organisations and community elders. Emphasising the importance of demonstrations, McClelland, Gartman and Van Rees (2004:2) asserted, "Ideas need to be shown" to improve comprehension.

The study by Byamugisha *et al.* (2008:98) found that the main communication channels preferred by urban farmers in Uganda were oral - seminars, demonstrations, radio and other verbal sources. Likewise, Kanté *et al.* (2009:288) found that the key communication channel preferred by small-scale subsistence farmers in Mali for accessing agricultural and health-related information was oral interpersonal communication through the chief. The chief was very influential because of the African cultural oral tradition and the referent power that village elders had. These face-to-face communication methods increased trust and inculcated a "sense of identity" (Hildreth, Wright and

Kimble 1999). In contrast, the Birchip cropping groups in Australia mainly used faxes, manuals, field schools, field days, demonstrations, websites and virtual field days to disseminate agricultural information (McClelland, Gartmann and Van Rees 2004:9). On the other hand, in Mongolia, most dairy farmers relied on TV as the principal communication channel for accessing information, followed by village government officials, neighbours and milk stations, cellular phones, agricultural technicians and brochures (Zhao, Zhang and Klein 2009). As earlier pointed out by Van Den Berg and Jiggins (2007:663), mass communication channels played an important role in introducing modern agricultural technologies and farming practices to small-scale farmers (Van Den Berg and Jiggins 2007:663). The findings of the present study on the radio was the second most important communication channel used by individual farmers thus corroborated the findings of other authors (Rivera, Qamar and Mwandemere 2005:59) (see, **section 4.7.3.2**).

Contrary to Meyer's (2000:110) view that the print media did not have a place in the linkage mechanisms of illiterate small-scale farmers, the findings of the present study showed that although there was low usage of the print media, farmers often sought print materials and asked for handouts after training. This finding was consistent with other authors (Morris and Stilwell 2001:73; Stefano *et al.* 2005b:62,64). As pointed out by Morris and Stilwell (2001:72-73), the print media played a "critical supportive role" and complementary role to extension services by backstopping messages delivered orally. This was showed despite its disadvantages and in particular the illiteracy barrier. Linked to the importance of print materials, Stefano *et al.* (2005b:62,64) found that printed agricultural materials played an important role in providing information to organic farmers in South Africa. As highlighted in **section 6.2.5**, the education levels and thus literacy in Kirinyaga district were fairly high and the few farmers who could not read got members of their group or family members or neighbours to explain the content to them. The main reason for the low usage of print media was that there were no print information resources for farmers in rural areas to access (Kaniki 1989; Stefano *et al.* 2005b:60-63), otherwise, farmers cherished print materials and perceived them to be authoritative (Leach 2001a:55). The lack of print materials in the present study were evidenced by the very few of resource centres or rural libraries in the district (see **section 9.1.12**). Although the findings of the present study showed that face-to-face and oral communication were important to farmers, print materials were also an important channel (see **section 9.4.2**). However, there were limited print materials available for farmers in Kirinyaga district. These findings suggest the need for repackaging relevant print content for farmers, which combined local knowledge with external information in local languages.

As established by the present study and other authors, some farmers used tours and exchange visits (Noordin *et al.* 2001:515; Gianatti and Carmody 2007:171), video (Del Castello and Braun 2006:3), and modern ICTs (Alavi and Leidner 2001:121; Idiegbeyan-Ose and Akpoghome 2009:027). The

study findings showed that there were more farmers not belonging to a group who used cellular phones than farmers belonging to a group. The use of the cellular phone is discussed in detail in **section 9.5**. Some farmers and farmers' groups used traditional communication channels such as drama, stories and song. Davenport and Prusak (2000:82) noted, "a good story is often the best way to convey meaningful knowledge," and people tend to remember stories much easier than they remember facts (Wiig 2004:66). However, although song and dance were useful for sharing agricultural information, Daudu (2009:23) cautioned that it was expensive to mount, may not convey the message clearly and posed problems of trustworthiness. These findings suggest the need for a communication strategy that supported the use of traditional and modern communication channels that were appropriate for different categories of farmers.

#### **9.4.1.4 A gender analysis of the main communication methods used by small-scale farmers in capturing and sharing agricultural information and knowledge**

Male and female farmers used different communication methods for capturing and sharing information and knowledge (see **Table 6**). More male than female farmers attended meetings / barazas (59.7% versus 40.3% among the category of farmers belonging to a group (N=92) and 58.8% versus 41.2% among the category of farmers not belonging to a group (N=65)). The same pattern was observed for most communication methods in both categories of informants. Within the category of farmers not belonging to a group, there were equal numbers of male and female farmers who used demonstrations, and more female than male farmers for word of mouth passed on from elders. Further, the results showed that there were more male than female farmers who used ICTs (radio, TV, video, telephone - landline and cellular) to communicate, capture and share agricultural information and knowledge.

The findings of the present study showed that there were slight differences in the communication methods used for capturing and sharing agricultural information and knowledge. More male than female farmers used most of the communication channels including meetings, baraza, radio, TV, cellular phones and modern ICTs. These findings confirmed those of Leckie (1996:301), who showed that female farmers, like their male counterparts mainly used oral interpersonal communication channels. However, the present study established that there were more male than female farmers who used most communication methods, including modern ICTs. Kanté *et al.* (2009:288-290) observed that whereas female farmers in Mali ranked other farmers followed by meetings as their second and third preferences, male farmers cited the Community Learning and Information Centre (CLIC) which were equipped with ICT facilities, followed by meetings as their second and third preferences respectively. Kanté *et al.* (2009) found that the village chief was the key communication channel for male and female community members.

**Table 6: An analysis of the main communication methods used by gender**

N=92 for farmers belonging to a group, N=65 for farmers not belonging to a group

	Farmers belonging to a group			Farmers not belonging to a group		
	N (responses)	% Male	% Female	N (responses)	% Male	% Female
Meetings / baraza	77	59.7	40.3	17	58.8	41.2
Neighbours	71	62.0	38.0	38	60.5	39.5
Radio	68	61.8	38.2	43	58.1	41.9
Exchange visits	57	68.4	31.6	14	57.1	42.9
Demonstration	56	62.5	37.5	20	50	50
Word of mouth – elders	56	62.5	37.5	21	47.6	52.4
Study tours	43	67.4	32.6	5	60	40
TV	29	75.9	24.1	21	71.4	28.6
Shows	27	85.2	14.8	12	75	25
Print	22	72.7	27.3	5	60	40
Stories	20	50	50	3	100	0
Cellular phone	19	68.4	31.6	23	69.6	30.4
Song	18	61.1	38.9	2	50	50
Drama	14	50	50	0	0	0
Video	5	100	0	3	100	0
Artefacts	5	20	80			
Telephone(landline)	4	100	0	3	66.7	33.3
WorldSpace radio	1	100	0	2	100	0
Internet	1	0	100	1	100	0
Field Day	1	100	0			
Personal digital assistant				1	100	0

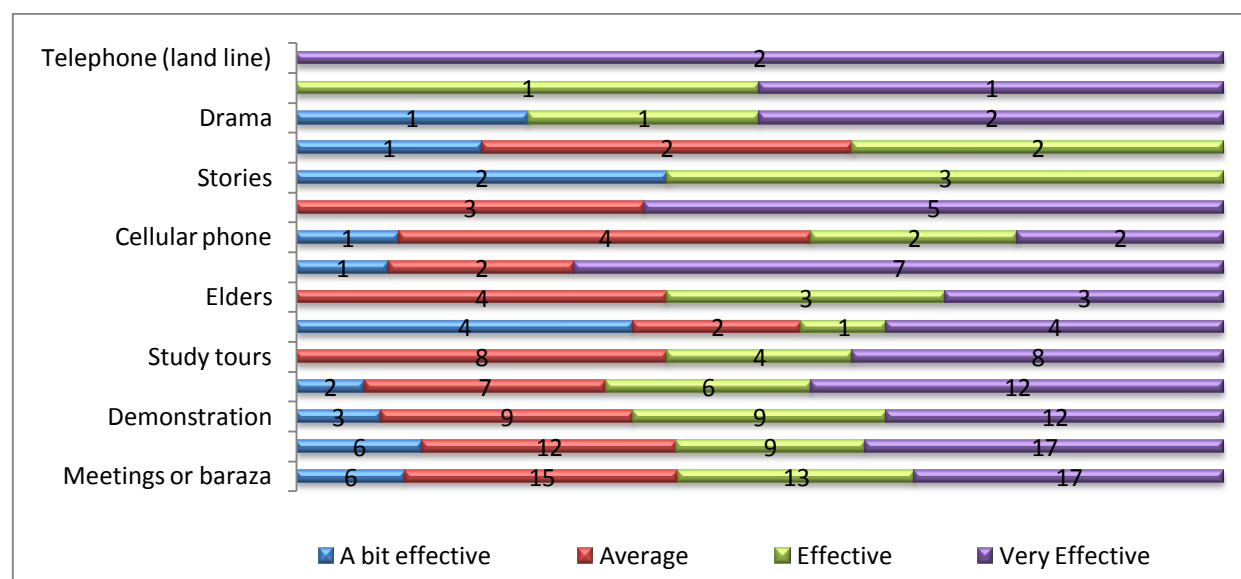
Although meetings and barazas emerged as a key communication method used by farmers, Moock (1976:835) observed that attendance at barazas was dominated by male farmers and there was little participation by female farmers. These findings suggest a need for a mix of oral, print and electronic communication channels when designing information and knowledge systems for rural communities. The finding of the present study on artefacts being largely used by female farmers concurred with that by Borgman (2008:18). In sum, the present study and many authors (Ngimwa, Ocholla and Ojiambo 1997:53; Ramírez and Quarry 2004:12; Kanté *et al.* (2009:288-290) established that there were gender differences in communication methods used by farmers, which implied the need for gender differentiated strategies and communication channels that integrate traditional and modern channels to ensure gender inclusion and the full participation of women in agricultural development. The present study supports the suggestion by FAO LiNKS Project (2003; 2004), and The World Bank (2004c) of integrating gender needs in AKIS projects.

#### **9.4.2 Effectiveness of communication methods used by small-scale farmers in accessing and sharing agricultural information**

Although small-scale farmers used a variety of communication methods, some methods were more effective than others were.

##### **9.4.2.1 Communication methods used by farmers' groups and their effectiveness in accessing and sharing information and knowledge**

In general, results on communication methods used by farmers' group (N=64) showed that 24 responses (37.5%) perceived the methods used to be very effective, 14 (21.9%) as effective, 18 (28.1%) as neither very effective nor not effective at all, and 8 (12.5%) as not effective. **Figure 47** summarises responses on the effectiveness of specific communication methods used by farmers' groups (N=64) in accessing or sharing agricultural information on a Likert scale of one to five. Seventeen (17) of the 51 responses (33.3%) that used meetings or barazas considered the communication methods they used to be very effective, 13 (25.5%) as effective, 15 (29.4%) as neither very effective nor not effective, and 6 (11.8%) as not effective. For radio, a comparable pattern was observed with 17 responses of 44 (38.6%) rating it as very effective, 9 (20.5%) as effective, 12 (27.3%) as neither very effective nor not effective at all (average), and 6 (13.6%) as not effective. Twelve (12) of 33 responses (36.4%) considered demonstrations to be very effective, 9 (27.3%) each as effective and neither effective nor not effective at all and 3 (9.1%) as not effective. Although the scales assigned for effectiveness of most of the methods were between three and five, there was a fairly high percentage (39.4%) of responses that indicated scale of between one and three (see **Figure 47**), suggesting a need to improve the effectiveness of the main communication methods used.



**Figure 47: The main communication methods used by farmers' groups and their effectiveness**

(Figures represent count of responses)

N=64

#### 9.4.2.2 Communication methods used by individual farmers and their effectiveness in accessing and sharing information and knowledge

Overall, the findings on communication methods used by farmers belonging to a group (N=86) showed that 32 responses (37.2%) perceived the methods used to be very effective, 22 (25.6%) as effective, 21 (24.4%) as neither very effective nor not effective at all, 6 (7%) as not effective and 5 (5.8%) as not effective at all. Findings on the specific communication methods used by farmers belonging to a group (N=85) showed that 26 of 71 responses (36.6%) perceived meetings or barazas to be very effective, 19 (26.8%) as effective, 18 (25.4%) as neither very effective nor not effective at all, and 4 (5.6%) each as not effective and not effective at all. Neighbours were considered to be very effective by 23 of 66 responses (34.8%), effective by 19 (28.8%), neither very effective nor not effective at all by 16 (24.2%), as not effective by 5 (7.6%) and not effective at all by 3 (4.5%). Radio was rated very effective by 23 of 63 responses (36.5%), as effective and neither very effective nor not effective at all by 17 each (27%), and as not effective and not effective at all by 3 (4.8%) each. It was observed that at individual level, more individual farmers used the print medium than in the case of farmers' groups. The findings showed that 34.3% of the responses were between scales one and three (neither very effective nor not effective at all or average, and not effective at all). These results were consistent with those obtained for farmers' groups and reaffirmed the need to improve the effectiveness of communication methods used.

General data on the perceptions of farmers not belonging to a group (N=53) on the effectiveness of the main communication methods used for accessing and sharing agricultural information showed



that 18 responses (34%) perceived the methods used to be very effective, 20 (37.7%) as effective, 10 (18.9%) as neither very effective nor not effective at all, and five (9.4%) as of little effectiveness. For the three most effective specific communication methods used by farmers not belonging to a group (N=53), results showed that 11 of 36 responses (30.6%) perceived radio to be very effective, 14 (38.9%) as effective, 7 (19.4%) as neither very effective nor not effective at all, 7 (19.4%) perceived radio to be of little effectiveness, and 4 (11.1%) as of little effectiveness. Neighbours were ranked very effective by 10 of 31 responses (32.3%), 14 (45.2%) as effective, 4 (12.9%) as neither very effective nor not effective at all and 3 (9.7%) as not effective at all. Demonstrations were ranked very effective by 9 of 20 responses (45%), 8 (40%) as effective, 2 (10%) as neither very effective nor not effective at all and 1 (5%) as of little effectiveness. Six of 19 responses (31.6%) perceived cellular phones to be very effective, 7 (36.8%) as effective, 4 (21.1%) as neither very effective nor not effective at all, and 2 (10.5%) as of little effectiveness. The findings showed that 26.2% responses ranked effectiveness between scale one and three (between not effective at all and neither very effective nor not effective at all).

The findings showed that meetings, barazas, radio, demonstrations and exchange visits were the most effective communication channels used by small-scale farmers for accessing and sharing information and knowledge. The percentages of farmers' groups and individual farmers who found the communication methods to be of average and below average effectiveness were significantly high (40.6% for farmers' groups, 37.2% for farmers belonging to a group and 28.3% for farmers not belonging to a group). These findings imply that there was a need to improve the effectiveness of the communication methods used by farmers.

Most farmers' groups and individual farmers cited oral communication channels (meetings and barazas, radio and demonstrations) as the most effective methods of accessing agricultural information and knowledge. As pointed out by Suvedi, Lapinski and Campo (2000), farmers liked face-to-face interaction and according to Suvedi, Lapinski and Campo (2000), there was "no substitute for interpersonal interaction." While meetings or barazas, radio and demonstrations emerged as the most effective communication methods of farmers' groups, farmers belonging to a group perceived meetings, neighbours and radio to be the most effective, while farmers not belonging to a group considered radio, neighbours and cellular phones as the most effective methods.

#### **9.4.3 Experience of small-scale farmers with the main communication methods used in accessing and sharing agricultural information**

Farmers' groups, farmers belonging to a group and farmers not belonging to a group had varying levels of experience with the communication methods used to access information and knowledge.

#### **9.4.3.1 Farmers groups' experience with main communication methods used in accessing and sharing agricultural information**

Most farmers' groups (N=60) had between very much and average experience with the main communication methods used, 21 (35%) had very much experience, 15 (25%) each had much experience and average (neither very much nor very little) experience, while 7 (11.7%) had little experience and two (3.3%) had very little experience. Results on the experience that farmers' groups (N=60) had with the top three communication methods they used for accessing and sharing agricultural information and knowledge showed that 17 of 48 (35.4%) were highly experienced with meetings or barazas, 13 (27.1%) each had good experience and average experience while 3 (6.3%) had little experience and 2 (4.2%) had very little experience. In the case of radio, 12 of 40 (30%) were highly experienced, 10 (25%) had good experience, 12 (30%) had average experience, while 5 (12.5%) had little experience and 1 (2.5%) had very little experience. The same trend was observed for demonstrations, with 10 of 32 (31.3%) as very experienced, 8 (25%) with good experience, 9 (28.1%) with average experience, and 5 (15.6%) with little experience. A similar pattern was observed with most of the other communication channels. A significant 38.5% of the informants rated their experience with the communication methods they used between scales one and three (very little experience and average experience) implying the need for training farmers' groups on how to optimise the main communication methods.

#### **9.4.3.2 Individual farmers' experience with main communication methods used in accessing and sharing agricultural information**

Data collected from farmers belonging to a group (N=80) indicated that more than half the informants had between very much and average experience in the communication methods they used in accessing or sharing information. Twenty five (25, 31.3%) had very much experience, 21 (26.3%) each had much and average experience, while 7 (8.8%) had little, and 6 (7.5%) had very little experience. Farmers belonging to a group showed that of the 66 responses for meetings or barazas, 20 (30.3%) were highly experienced, 17 (25.8%) each had good and average experience respectively, while 6 (9.1%) each had little and very little experience. Sixteen (16) of 61 (26.2%) were highly experienced with using neighbours, 17 (27.9%) each had good and average experience, while 7 (11.5%) had little experience and 4 (6.6%) had very little experience. The same pattern was depicted for radio, where 17 of 58 (29.3%) were very experienced, 16 (27.6%) each had good and average experience, and 5 (8.6%) had little and 4 (6.9%) had very little experience. The results showed that 42% of the informants had between very little and average experience.

Most farmers not belonging to a group (N=51) had between average and very much experience in accessing and sharing information with the main communication channels used. Results showed that



13 (25.5%) were highly experienced, 14 (27.5%) each had good and average experience respectively, while 5 (9.8%) each had little and very little experience respectively. Results obtained for the top three communication methods indicated that farmers not belonging to a group had more experience with radio, neighbours, demonstrations and cellular phone than the other communication methods. Of 34 farmers who used radio, 9 (26.5%) were highly experienced, 11 (32.4%) were experienced, 9 (26.5%) had average experience, while 4 (11.8%) had little experience and 1 (2.9%) had very little experience. Eight of 29 farmers (27.6%) perceived that they were highly experienced in consulting neighbours, 7 (24.1%) had good experience, 8 (27.6%) had average experience while 3 (10.3%) each had little and very little experience. 4 (20%) out of 20 had very good experience with demonstrations, 6 (30%) had good experience, 5 (25%) had average experience, while 1 (5%) had little and 4 (20%) very little experience. Seven of 19 (36.8%) were highly experienced in using the cellular phone, 4 (21.1%) had good experience, 5 (26.3%) had average experience, while 3 (15.8%) had little experience. Overall, 48.7% of farmers not belonging to a group had between very little and average experience with the communication methods they used for accessing and sharing information.

The emerging pattern from data collected from farmers' groups and individual farmers (belonging and not belonging to a group) indicated that although more than a half of individual farmers were highly experienced and experienced with communication methods used, there were relatively high percentages for those who had between very little and average experience (38.5% for farmers' groups, 42% for farmers belonging to a group and 48.7% for farmers not belonging to a group). These findings suggest the need to identify the challenges that farmers experienced with the different communication methods and to improve their skills. For example the low use of market information through SMS (see **section 9.5**) may be linked to a skills gap in the use of the cellular phone.

## 9.5 ICTs used for sharing and exchanging agricultural information and knowledge

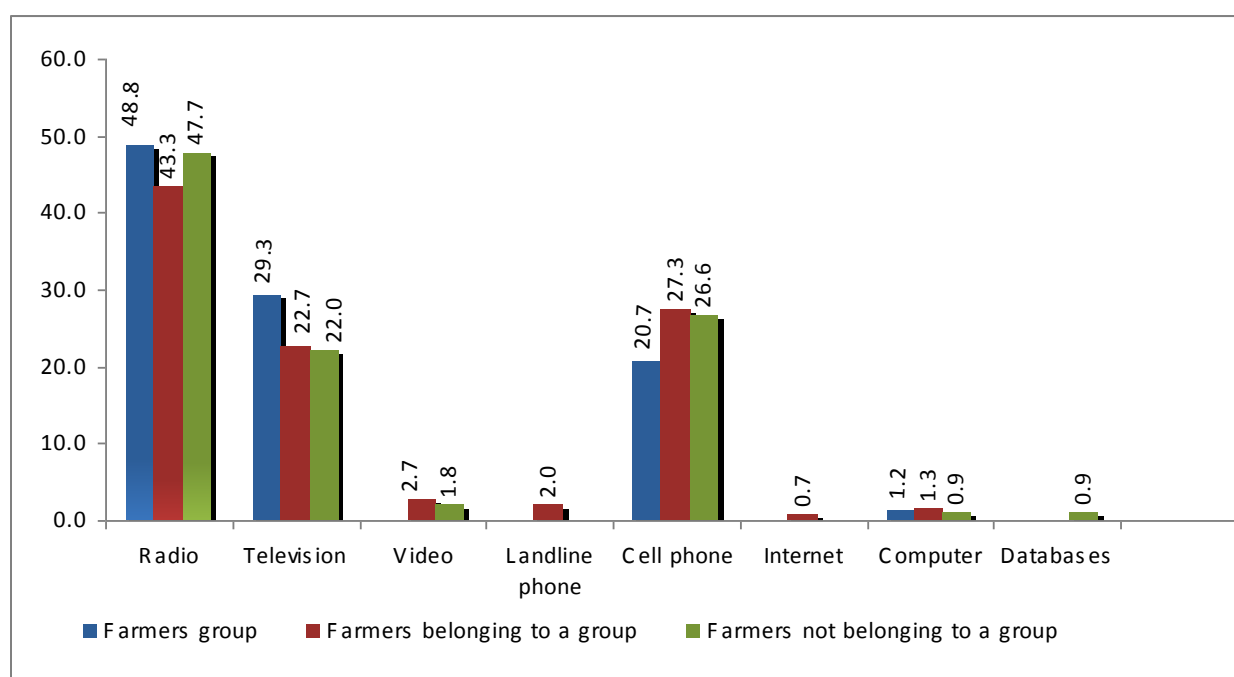
Among the communication methods used by farmers for sharing and exchanging agricultural information and knowledge were ICTs. This section aimed to answer the **research question 3.5: *What ICTs do actors (including farmers / farmers' groups) prefer to use and why (men, women and the youth)?*** Answers to the specific questions that focussed on the ICTs used revealed that farmers used different ICTs and men, women and the youth had different preferences.

### 9.5.1 Farmers' ICT preferences for accessing and sharing information and knowledge

**Figure 48** depicts the main ICTs that different categories of farmers preferred to use for accessing or sharing different types of agricultural information and knowledge. Radio was the ICT of choice for accessing and sharing information and knowledge of the three categories of farmers. The second was TV (for farmers' groups) and cellular phone (for individual farmers). Farmers' groups (N=50)

preferred to use radio (40, 48.8%), followed by TV (24, 29.3%) then cellular phones (17, 20.7%). The ICT preferences of farmers belonging to a group (N=73) were similar, to those of groups, but their order of preferences differed - radio (65, 43.3%), followed by cellular phones (41, 27.3%), and TV (34, 22.7%). Results for farmers not belonging to a group (N=56) conformed to those of farmers belonging to a group.

It was observed that there was less use of the cellular phone at group level compared with at individual level. This difference was likely to be because at group level, farmers relied more on the information and knowledge assets of the group, which they accessed through group meetings. The cellular phone was thus mostly used by the group officials to communicate with group members or to find information on behalf of the groups. On the other hand, farmers used the cellular phone to find the information they needed at individual level hence they used the cellular phone much more than the groups. TV was not used much because most farmers did not have access to TV sets. The results showed very low usage of modern ICTs such as the internet, databases and computers among all categories of farmers (see **Figure 48**).



**Figure 48: Farmers' ICT preferences for accessing and sharing information and knowledge**

N=50 for farmers' groups, N=73 for farmers belonging to a group, N=56 for farmers not belonging to a group

The present study showed that radio, TV and cellular phones were the preferred ICTs for accessing and sharing agricultural information and knowledge. These findings were similar to Kwake's

(2007:205-206), which showed that women in Rift Valley province in Kenya mainly used radio, TV and cellular phones to access agricultural information. The uptake of modern ICTs in Kirinyaga district was lagging behind and there were very few farmers using computers and the internet. The findings of the present study on radio and TV being among the top three preferred ICTs validated the MASA approach (see **section 3.2.4.2**), which assumes that viewers and listeners are factual creators of messages and not merely recipients and information is part of the “sense-making symbolic environment” (Case 2002:148). The present study showed that the listenership and viewership patterns were affected by the time of broadcasting, the content covered, the language used and the frequency of programmes. As explained by Westerik *et al.* (2009:38), people watched TV as a routine and in response to the changes in every day life and were affected by the time of day, physical presence at home and the chores carried out by an individual and programme scheduling. The finding on low usage of modern ICTs confirmed those of other studies elsewhere in Africa including Kalusopa (2005:419) in Zambia, Chisenga, Entsua-Mensah and Sam (2007:11) in Ghana, Kinengyere (2007:339-340) in Uganda, Kante *et al.* (2009:284) in Mali, and Okello, Okello and Ofwona-Adera (2010:15) in Kenya. In Kirinyaga district, internet facilities were only available at the Ministry of Agriculture’s district headquarters office (on one stand-alone computer) and at the MIAD centre. It was noted that the divisional headquarter offices did not have connectivity, and staff who needed to use the internet relied on nearby cyber cafés. Findings by Okello, Okello and Ofwona-Adera (2010:15), confirmed similar trends in Western Kenya, and cited cost of airtime and ICTs, poor rural electricity infrastructure and low literacy levels as key barriers.

Although the usage of ICTs in Kirinyaga district was very low, ICTs have the “power to store, retrieve, sort, filter, distribute and share information” (Juma and Yee-Cheong 2005:49). ICTs have been used by small-scale farmers in other parts of Kenya to access and share agricultural information (Bachelor, Hafkin and Chéneau-Loquay 2005; KACE 2007), and in other developing countries (Karamagi Akiiki 2008:16; Mangstl 2008:5; Idiegbeyan-Ose and Akpoghome 2009:027). The present study and other authors (Wirastuti *et al.* 2008:136; Munyua, Adera and Jensen 2009:7; Okello, Okello and Ofwona-Adera 2010:15) showed that the most commonly used ICTs in rural farming communities were radio and cellular phones. The study by Bagnall-Oakeley and Ocilaje (2002) showed a similar trend in Uganda. In South Africa, Stefano *et al.* (2005b:61) established that radio and TV were the main electronic media used by farmers. In Nigeria, Okwu, Kuku and Abaz (2007:017) confirmed that radio was an important medium for disseminating agricultural information in Nigeria.

Ha, Okigbo and Igboaka (2008:402) posited that farmers were interested in modern ICTs and would take advantage of them once they were made available. However, Chisenga, Entsua-Mensah and Sam (2007:11) found that uptake of market information systems was low even in places where ICTs

were accessible and there were good systems for farmers such as Trade.net (see **section 4.7.3.2**). In this regard, many authors (Curry, Kooijman and Recke 1998:6; Mutua-Kombo 2001; Ramírez and Quarry 2004:12; Karamagi Akiiki 2006:76) have suggested the need to root ICTs used in the cultural background of the different communities in order to improve their uptake. The present study and other authors imply that a wide range of modern and traditional ICTs needed to be deployed to suit the preferences of different categories of farmers in rural areas. An area for further research is to address the rural paradox of why farmers do not exploit ICT applications that are locally available and beneficial to them.

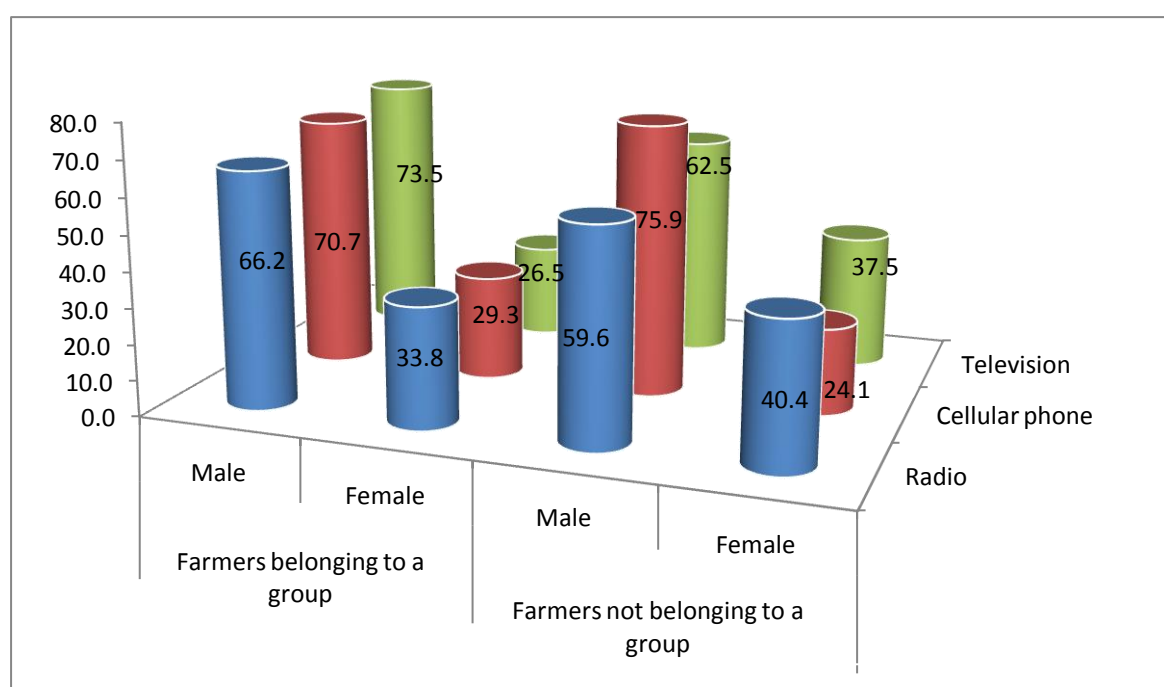
Nevertheless, the convergence of traditional and modern ICTs ensured wider access to knowledge and information in rural areas (Attias and Deflander 2003; Kwake 2006; Wild 2006:1) to address the challenges of the digital divide between the urban and rural areas (Mehra, Merkel and Bishop 2004:782). According to Del Castillo and Braun (2006:48), the integration of media has ensured effective communication among the different actors of an AKIS because different actors had varying needs and preferred different communication channels. Emphasising the importance of convergence, Wild (2006:1) pointed out that digitisation had made it possible to store contents of different types (video, text, audio) in the same format and to deliver it through diverse technologies such as telephones, TVs, computers. **Section 4.7.3.2** discussed other integrated ICT application tools used by small-scale farmers to access and share agricultural and market information and knowledge, such as the CELAC programme and Farmer's Friend in Uganda, and NAFIS, KACE and Soko Hewani in Kenya.

The findings of the present study concurred with the conclusion of Rivera, Qamar and Mwandemere (2005:13,54), that ICTs hold great potential in agricultural information and knowledge systems. Nevertheless, there is consensus “on the need to focus attention on ICT interventions that match local needs and conditions” (Juma and Yee-Cheong 2005:54). There is thus a need to raise awareness, and to sensitise and train farmers on the potential and importance of using the available electronic information and knowledge systems where the ICT infrastructure permits. In addition, the findings point to the need to develop appropriate policies and strategies that facilitate exploitation of ICTs and innovative adaptation of available ICTs to improve access to knowledge and information by farmers. As noted by Galloway and Mochrie (2005:42), the policy making process needs to involve the rural people.

### **9.5.2 A gender analysis of the main ICTs used for accessing and sharing information and knowledge**

Results of the two categories of individual farmers (belonging and not belonging to a group) and ICT preferences by gender revealed that more male than female farmers preferred to use ICTs (radio,

cellular phones and TV) for accessing and sharing agricultural information. The results showed higher male figures among the category of farmers belonging to a group than farmers not belonging to a group for TV (73.5% versus 62.5%) and radio (66.2% versus 59.6%) except for cellular phones, which was higher among the category of farmers not belonging to a group (70.7% versus 75.9%) (see **Figure 49**). This difference was likely to be because farmers not belonging to a group did not participate in many training sessions and meetings, hence did not have a network of peers to consult, implying the need to contact many different actors to find information to satisfy their needs. The findings of the present study on gender disparity suggest that there is gender social exclusion in terms of ICT usage in rural areas, and point to the need for policies and strategies that ensure inclusion of women.



**Figure 49: A gender analysis of the ICT preferences of farmers**

N=50 for farmers belonging to a group and N=56 for farmers not belonging to a group

### 9.5.3 Analysis of ICT preferences by type of group

An analysis of ICT preferences of the different types of farmers' groups (N=50) showed that radio was the most preferred ICT by all the groups, followed by TV and cellular phones. Although the sample size for youth only groups was very small (3 informants), results indicated that the youth only groups used radio as much as TV and cellular phones, while the male only groups used radio as much as TV, and the female only groups used TV as much as cellular phones. Of the 40 groups that cited radio, 25 (62.5%) were mixed groups, 11 (27.5%), 3 (7.5%) were male only and 1 (2.5%) was youth only. Among those who expressed preference for TV, 15 out of 24 responses (62.2%) were mixed

groups, 5 (20.8%) were female only groups, 3 (12.5%) were male only groups and 1 (4.2%) was youth only. Ten of the 17 groups (58.8%) that preferred cellular phone were mixed groups, 5 (29.4%) were female only and 1 (5.9%) each were youth only and male only groups respectively.

#### 9.5.4 Reasons for ICT preferences

The reasons cited for the ICT preferences were consistent across the three categories of informants (see **Appendix 118**). Radio was preferred because of its availability, versatility and wide reach and coverage. Informants explained that the radio passed on information orally and in local languages and disseminated general agricultural content that was current. Some radio programmes were interactive and allowed farmers to listen and share their views with other farmers. Cell phones were preferred because they were pervasive and facilitated communication, ensured speedy delivery of information and knowledge from experts, and helped to access market and price information. TV was preferred because it combined audio messages and images, which enhanced learning and understanding.

The study findings showed that farmers preferred to use simple ICTs such as radio, TV and cellular phones. The MASA approach (Case 2002:148) (see **section 3.2.4.2**), which assumes that the mass media offers information about things, actions or events through distribution of messages partially explained the reasons for the preference of radio and TV. In trying to make sense of information they listened to on the radio or in programmes watched on TV, a few farmers phoned in to the media house to air their views or ask questions. Farmers generally evaluated the relative importance of the message they received based on their social situation. In a sense, the farmers were receivers and creators of information (in cases of interactive radio / TV programmes). These findings have implications for information providers, and suggest the need to use simple ICTs that are effective in reaching many farmers. The high cost of calls and jammed lines that were cited as barriers suggests the need to increase the number of lines and make calls from farmers “toll free” to encourage more farmers to interact to share their views and ideas.

By comparison, although farmers in developing countries preferred simple ICTs, rural communities in transition countries preferred modern ICTs. For example, in the Czech Republic, farmers used virtual decision-support systems such as audio conferencing, video conferencing, interactive video and bulletin boards, as well as decision analysis tools to facilitate decision making (Tichá and Moulis 2004:60-61). A study on the contribution of ICTs in increasing agro-based entrepreneurs productivity in Malaysia found that the most preferred ICTs were the cellular phone, TV and landline telephone respectively (Samah *et al.* 2009:95). In the advent of globalisation and the information age, developing countries need to “map the fit” between information services provided, which are largely traditional and the global information services for farmers in transition and developing countries.



Information providers should endeavour to use both traditional and modern ICTs where the infrastructure is available, and develop relevant local content, so that small-scale farmers in developing countries are not “left behind.” As pointed out by various authors (Garforth, Khatiwada and Campbell 2003), ICTs offer greater opportunity to rural communities because they offer a wide reach, and permit the packaging of information in multiple formats that address the needs and circumstances of local populations (Chapman and Slaymaker 2002:9) (see **section 4.7.3.2**).

In 2008, Kenya had an internet penetration level of 8.7%, compared to the average of 4% for Africa, and 23% globally (ITU 2009:6-7,60). Although ICT usage was low in rural areas, there were various ICT applications that were linked to traditional ICTs. The convergence of traditional and modern ICTs has ensured wider access to knowledge and information in rural areas (Attias and Deflander 2003; Kwake 2006; Wild 2006:1), and effective communication among the different AKIS actors who had varying communication channel preferences (Del Castillo and Braun 2006:48). Convergence of different emerging ICTs has facilitated digitisation and made it possible to store content in multiple formats (video, text, audio) to cater for the different ICT preferences. As stated by Mangstl (2008:5), developing countries need to change the manner in which agricultural knowledge and information on innovations and markets is shared and accessed by small-scale farmers and use the new digital systems.

The cellular phone for example is pervasive in rural areas, and as pointed out by Stilwell (2008:150,151), it is an appropriate tool for bridging the digital divide and for addressing the needs of the wider rural population in terms of available infrastructure, local content and cost. For example, Kenya had 16.2 million cellular phone subscribers in 2008, and a penetration of 42% (ITU 2009:15,58). **Section 9.5.5** presents a number of innovative cellular phone applications for farmers. Longbottom (2009) concurred with the point made by Stilwell (2008:150,151) above and added that computers were not part of the lives of the rural people in developing countries and that the cellular phone was a simpler and more practical device. An area for further research would be to examine the role and application of the cellular phone in improving access to agricultural information in rural areas.

The finding of the present study on more male farmers not belonging to a group using the cellular phone for accessing and sharing information than farmers belonging to a group may be partially explained by the observation that men had many social contacts and while men belonging to a group met face-to-face with other group members and shared problems, experiences, solutions and information, men not belonging to a group did not have such networks. Consequently, men not belonging to a group made more calls to access the same information. The findings of the present study showed that radio was the most preferred ICT by all the groups, followed by TV and cellular

phones. More members in mixed groups tended to use ICTs than was the case of male only, female only or youth only groups. However as noted by Anderson (1999:242), women and the youth in rural areas had less access to new ICTs than men.

#### **9.5.5 Application of ICTs by small-scale farmers**

Farmers in Kirinyaga district used a variety of ICTs in their farming activities to access different types of information. Radio was mainly used to access general agricultural information on a wide variety of topics, including new products or technologies, weather and early warning information such as pest and disease epidemics. The AIRC aired agricultural radio programmes in vernacular languages that were very popular among farmers. Farmers' groups used cellular phones mainly for two-way communication to invite facilitators to group meetings or demonstrations and to communicate with group members as well as to seek information on behalf of the group. At individual and group level, the cellular phone was used to request specific information from experts, farmers' groups or other farmers or when farmers needed to ask a question(s). Some farmers used the cellular phone to access price and market information but generally most farmers were not aware that they could access agricultural information through SMS. A few used the cellular phone to interact with agricultural radio programmes. Some farmers watched TV to access general agricultural information from agricultural related programmes. There was very little use of computers, databases and the internet for accessing information, with the exception of one group, which acquired a computer through a pest management project for accessing technical information and for managing information they collected. It was observed that although the AIRC produced videos on various agricultural topics, farmers in Kirinyaga district were not aware of their existence.

Discussions with the AIRC informants showed that the centre produced a number of agricultural videos and radio programmes that were aired in local languages. The findings of the present study on low awareness of the AIRC video resources indicate that the videos had not penetrated the farming community in Kirinyaga. Nevertheless, videos have been used elsewhere in Kenya for training, especially where illiteracy levels were high (Kiplang'at 1999:121). Apart from radio, TV and videos, which were traditional ICTs, modern ICTs were rapidly penetrating into the rural areas and there were many innovative ICT applications for farmers. According to Gakuru, Winters and Stepman (2009:2), voice solutions were "by far the most promising platform for the farmer." For example, the NAFIS system was developed based on the voice as opposed to text, which made it more attractive to farmers who cannot read and write. NAFIS combined telephone (audio and SMS) and the internet and provided production and marketing information to farmers. However, the findings of the present study showed that NAFIS was not well known. It should, however, be noted that at the time of data collection, (July to September 2008), NAFIS was a few months old (see **section 4.7.3.2**). In fact,



there was only one informant in Kirinyaga who had used the service. This finding suggests the need for raising awareness about the service, and training farmers how to use it.

Other applications of ICTs by small-scale farmers in Kenya included Soko Hewani, which integrated radio and cellular phone (Munyua 2007). Soko Hewani is available in Western Province and had not been introduced in Central Province. These findings suggest the need to establish rural resource centres to provide access to available information resources. These centres could serve as “digital villages” and offer diverse information and knowledge services, such as the Merti Maarifa digital village in Isiolo. The Merti Maarifa digital village was established through a partnership of the EU, the GoK, ALIN-EA, the Merti Integrated Development Programme and the Rangeland Users Association. The centre collects, processes and shares information and knowledge on disaster preparedness and drought management in general for pastoralists and other users (The Standard 2010:31).

The findings of the present study imply the need to create awareness of existing information resources and on the potential of ICT applications, and the need to train farmers on how to use them. There were also a few initiatives on digital villages and knowledge centres that provided access to connectivity and development information based on the needs of the community that were managed by NGOs such as ALIN-EA and AfriAfya (**sections 4.7.3.2 and 4.7.6.2**). Kirinyaga district faced challenges of connectivity, which limited the application of many innovative ICT systems for farmers. In addition, farmers and entrepreneurs need to exploit the possibilities and opportunities availed by modern ICT applications such as the M-Pesa, ZAP and M-Kesho services to address some of the challenges raised by farmers such as late payments for their produce. Farmers could be paid promptly at the farm gate or market place or marketing shed upon exchange of goods using M-Pesa (Munyua, Adera and Jensen 2009:5) or ZAP (ZAIN 2010) or M-Kesho electronic money transfer (Opiyo 2010) via an SMS. Farmers could then redeem the cash at the nearest Safaricom or Zain agent or Equity Bank.

Other applications of ICTs by small-scale farmers include the LLL initiative in parts of Kenya and Tanzania. The LLL service integrates the internet, cellular phone and radio, which the *shushushus* applied to access and share agricultural information and knowledge and in particular market and marketing information (Lightfoot and Scheuermeier 2006:15). In neighbouring Uganda, farmers under the CELAC project were using “Google maps” to share agricultural information and market information (Karamagi 2008:16). The CELAC project was also using web-based platforms (Web 2.0 tools) to facilitate the sharing of local knowledge.

### 9.5.6 Helpfulness of ICTs in farming activities

Farmers' groups (N=40) expressed varying levels regarding their perceptions of the helpfulness of the main ICTs used by small-scale farmers in farming activities. On a Likert scale of one to five, 26 groups (65%) ranked the construct helpfulness of ICTs as very helpful and helpful. Fifteen informants (15, 37.5%) perceived the ICTs used as very helpful, 11 (27.5%) each as helpful and neither very helpful nor not helpful at all. Two informants (5%) considered the ICTs to be only slightly helpful and one (2.5%) as not useful at all. With regard to specific ICTs used by small-scale farmers, 12 of 33 groups (36.4%) perceived radio to be very helpful, 9 (27.3%) each as helpful and neither very helpful nor not helpful at all, while 2 (6.1%) considered radio to be a little helpful and 1 (3%) as not helpful at all. Seven of 18 (38.9%) regarded TV as very helpful, 4 (22.2%) as helpful and 6 (33.3%) as neither very helpful nor not helpful at all, and 1 (5.6%) as not helpful at all. Six of 15 (40%) perceived the cellular phone to be very helpful, 5 (33.3%) as helpful and 4 (27.6%) as neither very helpful nor not helpful at all. The results showed that 35% of the farmers ranked the helpfulness of the ICTs between scale one and three (not helpful at all and neither very helpful nor not helpful at all).

Two thirds of the groups perceived the ICTs they used to be between very helpful and helpful, but a significant 35% viewed them as neither very helpful nor not helpful at all (average) and not helpful at all. These findings suggest the need to strengthen and improve radio and TV programmes as well as other initiatives exploiting the potential of the cellular phone and other ICTs, by taking into consideration the barriers and constraints identified in **section 9.5.7**. Supporting the two-way communication, Ramirez and Quarry (2004:12) reiterated that allowing people to express themselves using their own voice helped others to identify with the voice, which motivated others. Some farmers phoned in and shared their information, knowledge and ideas with other farmers. Among the reasons why most people did not phone in included high costs of communication and congested lines. This finding thus suggests the need for intervention to make ICTs more helpful to farmers. For example, toll free lines could be introduced to enable farmers to phone in and ask questions or seek clarification.

Nevertheless, farmers acknowledged the usefulness of ICTs and as noted by Thysen (2000:301), "The majority of farmers will ... use ICTs if they consider [them] to be economically beneficial." In Uganda for example, most farmers tuned in to their local FM radio stations and benefitted from the regular updates of market information (Ferris, Engoru and Kangazi 2008:11). In Kenya, KACE provided linkage mechanisms between sellers and buyers of agricultural commodities (Mukhebi *et al.* 2007:24-25). The findings of the present study showed that the few groups that had benefitted from the application of market information services of KACE acknowledged that the service had helped them find export markets and very good prices for their commodities. The study findings showed

that ICTs were helpful to farming activities but farmers cannot demand what they do not know. These findings suggested the need for promoting existing information systems and services to improve the flow of information and knowledge and strengthen linkages between actors.

#### **9.5.7 Barriers and constraints experienced with ICTs**

The main barriers and constraints experienced by farmers in Kirinyaga district with ICTs included poor telecommunication infrastructure, poor rural electricity infrastructure, lack of ICT equipment, inadequate ICT skills, inappropriate broadcasting times and high cost of information. Other barriers and constraints included inappropriate content, short length of programmes aired on radio and TV as well as language barriers, lack of databases in rural areas, distance to internet access points, inadequate skills in the use and application of ICTs as well as low awareness of available resources and systems. Results also showed that most farmers mainly used the cellular phone for social communication and not for accessing agricultural information. Aside from the general barriers and constraints pertaining to infrastructure, farmers experienced challenges with specific ICTs used. The major barriers or constraints encountered with the top three ICTs used by farmers were:

*Radio:* The broadcasting times were perceived to be inappropriate as most programmes were aired in the mornings when farmers were busy in the field; the duration of programmes was too short; information provided was not comprehensive and some was not relevant. For example, one farmer remarked, “we heard about the new variety but we do not know where to buy the seed.” Other barriers included the agricultural programmes were not frequent on radio; distortion of messages – some of the content provided on radio was perceived to be unclear, inaccurate, conflicting, confusing or irrelevant; content provided did not correspond to the needs of farmers (radio and TV programmes; and radio batteries were expensive and lasted for a short duration. *Cellular phones:* High cost of airtime; information provided was not comprehensive; and weak cellular phone network leading to poor reception. *Television:* There were very few agricultural programmes on TV and only a few farmers had access to television sets.

The low usage of ICTs was consistent with other authors (Kwake 2007:220; Munyua, Adera and Jensen 2009:5; Samah *et al.* 2009:97). The findings on barriers and constraints encountered by small-scale farmers in Kirinyaga district with the use of ICTs were similar to those of other authors (Kiplang’at 1999:121; Stilwell 2000:188-189; Thysen 2000:301; Heeks 2007; Kwake 2007:220; Catts and Lau 2008:35). The low usage of ICTs may be explained by factors such as low appreciation of knowledge (Scoones and Thompson 1993:2; Onduru *et al.* 2002; Von Liebenstein 2000:2), poor telecommunication and ICT infrastructure, and high cost for ICT services (Kiplang’at (1999:121; Jensen 2006:3; Kapange 2006:157; Richardson 2006; Stilwell 2008:150; Munyua, Adera and Jensen

2009:5), inappropriate ICT policies (Jensen 1997; Heeks 2007; May, Karugia and Ndokweni 2007) as well as challenges pertaining to implementation of policy (Kerrets 2004:61).

Although Kenya has a draft ICT policy, this document has remained in draft form for several years. As pointed out by Waema (2005), there were many challenges associated with policy formulation including weak and incoherent institutional frameworks, the lack of ICT champions in government and insufficient funding; education levels and the age of farmers (Thysen 2000:298); literacy barriers, language barriers and cultural diversity barriers (Lallana and Uy 2003:32); governments not spending enough resources on knowledge production (Mchombu 2005:2) and lack of information providers and local content (Del Castello and Braun 2006:5).

With regard to radio and TV, Bembridge and Tshikolomo (1998:25) in South Africa established that despite the high numbers of fruit farmers who listened to the radio, the information broadcasted lacked technical content and was of general nature. As identified by the present study, and by Bagnall-Oakeley and Ocilaje (2002), the broadcasting times were not appropriate to farmers. There were also low listenership, and poor timing and language, which hindered farmers from listening to the radio. In addition, Stefano *et al.* (2005b:61) found that the agricultural programmes on radio and TV in South Africa were not relevant to the needs of small-scale farmers. Like the present study, Okwu, Kuku and Abaz (2007:016) identified broadcasting time (mornings and afternoons) when farmers were busy, communication language and topics covered in relation to farmers needs as the main barriers to use. Those who did not listen cited lack of awareness of when agricultural programmes were broadcast, unsuitable timing and lack of radios. These findings suggest the need to repackage radio programmes to target the needs of farmers instead of broadcasting non personalised general messages.

The finding of the present study on most farmers using the cellular for social communications and not for accessing agricultural information corroborated the findings by Giné (2005). Confirming these findings, Wirastuti *et al.* (2008:137) noted that although farmers had access to cellular phones (either owned or borrowed from relatives or friends), they normally waited to be called because of the high cost of making calls and only called when it was very necessary. According to Wirastuti *et al.* (2008), many farmers were not comfortable about sending text messages. Those who sent SMSs faced the challenge of limited space that carried the text message (Gakuru, Winters and Stepman 2009:2). In addition, the borrowing of telephones by neighbours and friends and the low education levels limited farmers from using some features of the telephone such as the SMS service (Okello, Okello and Ofwona-Adera 2010:14-15). An area for further research would be to study the impact of cellular phone applications and other ICTs on farming.

The findings on low levels of education and subsequent limitations in using the SMS service had implications for information providers and suggests the need for considering the voice option when repackaging content for farmers. Likewise, the finding by Wirastuti *et al.* (2008:137) on cost of service implied the need to subsidise or lower costs of calls or text messages to and from agricultural information and knowledge systems such as market prices, weather, and production information until farmers get hooked to these services and appreciate the value of information.

With regard to agricultural information systems and ICT resource centres, Poupyrev, Maruyama and Rekimoto (2002) noted that designing interfaces linked to cellular phones for rural communities posed challenges that had not been studied adequately. Ferris, Engoru and Kangazi (2008:11) found that most farmers were not aware of the availability of market information through SMS, while Maatman and Schrader (2009:5) pointed out that many emerging market information systems were difficult to access. In their study on ICT resource centres in rural areas, Ochieng and Waema (2009) identified several barriers and constraints to use in Kiangwaci, Kenya, including distance to the resource centre, busy schedules of farmers on their farms, fear to use ICTs, language barriers and lack of ICT skills. Such barriers serve to explain the low uptake of ICTs in Kirinyaga district. Furthermore, considering the investment that goes into developing information systems, the present study and other authors suggest a need for evaluating existing ICT applications for farmers such as NAFIS, market information systems (KACE, Foodnet and Tradenet) in rural settings against the challenges hindering their use in order to improve their design and ensure uptake by rural communities.

### **9.5.8 Impacts of ICTs on farming activities**

Farmers narrated a variety of ways in which ICTs had impacted on their farming activities. Some had adopted new technologies as a result of listening to radio messages. Others said they received information more quickly and regularly, which had contributed to their learning and understanding. Among the category who used cellular phones, some said they had found good markets and prices for their produce while others had saved on communication costs. **Appendix 119** presents some examples on the impacts of ICTs on farming activities categorised under:

- i) Increased knowledge and awareness, for example one group stated, “Information reaches us very fast and on a daily basis.”
- ii) Increased adoption of technologies, for example another group narrated, “We first heard of rabbitry from a radio programme then we demanded training and decided to adopt rabbit farming.”
- iii) Improved production and increased profits, for example one group stated, “ICTs have changed the group from subsistence to commercial farming.”

- iv) Access to markets, for example the tree seedlings group said, “People who want to buy seedlings call us directly using cell phones.”
- v) Improved communication, one group stated, “ICTs have facilitated us to demand for service from information providers when we need it and we get interventions much quicker.”

### **9.5.9 Feelings experienced in connection with use of ICTs**

Farmers belonging to a group (N=69, 76 responses) expressed different feelings in connection with the use of ICTs in accessing and sharing agricultural information and knowledge. The Sense-Making methodology and Sense-making theory (Dervin 1998; 1999:728; 2007; Foreman-Wernet and Dervin 2006:289; Naumer, Fisher and Dervin 2008), which is philosophically grounded in the phenomenological and interpretive perspectives (see **sections 3.1.2**) (Naumer, Fisher and Dervin 2008) offered an approach to gathering, analysing and interpreting what farmers really thought, felt, wanted, their perceptions and changes over time and space, as well as the impact and outcome of their feelings in connection with the ICTs they used (see **sections 3.2.2.1** and **5.1.5**).

Farmers shared feelings of happiness and satisfaction, as well as uncertainty and ambiguity (see **Appendix 120**). Farmers expressed different feelings regarding the appropriateness, efficiency, effectiveness and relevance of ICTs in connection to farming. For example, one farmer stated, “ICTs have saved time and speeded up delivery of information.” Another remarked, “ICTs disseminate agricultural information and knowledge regularly.” Some of the farmers who expressed feelings of uncertainty and ambiguity in connection with the use of ICTs argued that ICTs shared useful information but the information was sometimes not relevant to their needs. Others said the information obtained was not adequate, while others felt that the ICTs needed to be made more affordable.

### **9.5.10 Perceived impact of feelings experienced in connection to the use of ICTs**

The Sense-making theory (Dervin’s 1998:39,41; Naumer, Fisher and Dervin 2008) guided the study and helped to explain the feelings experienced by farmers in connection to use of ICTs and their consequences (impact and outcome) in time and space. Results indicate that the feelings experienced were seen to have impacted on the lives of farmers in various ways. Some farmers indicated that ICTs had i) led to improved farming activities, yields and profits, ii) enhanced communication, iii) improved access to markets and price information, iv) saved time and energy, v) improved access to agricultural information and knowledge and vi) enabled farmers to learn about new farming methods, technologies and innovations.



### 9.5.11 Outcomes of ICTs on farming

Farmers cited various outcomes of ICTs on farming, including improved access to information and knowledge, increased awareness of new technologies, increased learning and understanding on issues such as diseases, use of appropriate agrochemicals and farm management in general. Others mentioned increased adoption of new technologies and farming methods, improved markets and prices and increased yields and profits.

Farmers experienced different thoughts, feelings and had different perceptions and wants in connection with the ICTs they used over time and space. As presented above, most farmers experienced feelings of happiness and satisfaction. A few farmers had used the cellular phone to access market information and were happy with the service. Others perceived ICTs to be efficient in delivery of information in terms of time, speed and the frequency at which one could access information. For example, with TV, farmers could see and hear hence the medium was perceived to be more reliable (Leach 2001a:56). However, some had reservations in connection with the effectiveness and relevance of ICTs in accessing and sharing agricultural information and knowledge. The few who had reservations experienced feelings of uncertainty and ambiguity about the use of ICTs argued that information shared through ICTs was not adequate and some was not relevant to their needs, while others perceived ICTs to be expensive. These feelings may be linked to the observation that although some radio programmes were interactive, some farmers were not aware of this and thought that they were not interactive. As noted by Leach (2001a:56), those who tried telephoning often found the lines congested. The few agricultural programmes on TV were usually in English and a few in Kiswahili. As pointed out by many authors (Bagnall-Oakeley and Ocilaje 2002; Chapman *et al.* 2003:10; Best *et al.* 2005) the language used for radio and TV was difficult for farmers.

Farmers who used ICTs to access information and knowledge perceived that ICTs had improved access to markets and price information. This finding was similar to other authors (Torero and von Braun's 2006:4-5; Chisenga, Entsua-Mensah and Sam 2007; Munyua 2007; Muto and Takashi 2009:1895). For example, Muto and Takashi (2009:1893) found that in Uganda, the penetration of the cellular phone due to network expansion increased banana sales in disadvantaged areas. The outcome of improved access to agricultural information and knowledge was similar to that established by earlier authors (Mukhebi *et al.* 2007:24; Muto and Takashi 2009; Sahah *et al.* 2009:95). Other outcomes of ICTs on farming included increased yields and profits, enhanced communication, improved access to markets and price information, saved time and energy, improved access to agricultural information and knowledge, increased knowledge and understanding, increased awareness of new technologies, and increased adoption of new technologies and farming methods. Qiang, Rossotto and Kimura (2009:40) showed that broadband had improved the lives, transformed

processes, businesses and relationships of rural incomes in India through e-Choupals that provided better access to agricultural and market information (see [section 4.7.3.2](#)).

## **9.6 Summary**

Chapter nine investigated the primary actors, linkage mechanisms and type of linkages between actors and examined the types, nature and quality of relationships between actors. This Chapter discussed the flow of knowledge and information between stakeholders and the main communication channels, and ICTs used by farmers for accessing and sharing agricultural information and knowledge by gender and type of group. Finally the Chapter presented and discussed the major barriers and constraints encountered with ICTs in accessing agricultural information and knowledge and their impact and outcome on farming.

The primary actors comprised producers, public, private, civil society, education and training, as well as research and development partner actors. Information flowed mainly horizontally and most actors interacted directly with farmers, but there were a few vertical linkages. Linkages between farmers and other actors were generally weak. Most farmers used oral traditional communication channels such as meetings, radio and demonstrations. Individual farmers belonging to a group mainly used meetings, neighbours and radio, while farmers not belonging to a group mainly used radio, neighbours and cellular phones. Farmers preferred to use radio, TV and cellular phones, but the usage of ICTs was generally low. There were more male than female farmers who used ICTs. The following section presents the key findings of the study for objective three on linkages, flows of information and communication channels used by farmers.



# CHAPTER TEN: USAGE OF AGRICULTURAL KNOWLEDGE AND INFORMATION

## 10.0 Introduction

Chapter ten focuses on **research objective four: Assess the usage of knowledge and information**, and presents and interprets findings on the subsequent nine research questions under this objective (see **section 1.4**). This Chapter focuses on the types of information and knowledge that farmers used and their frequency of use. In particular, the Chapter looks at the types of information and knowledge that helped farmers make major decisions or innovation, gain understanding or solve a problem(s). It illustrates how farmers made decisions that dealt specifically with risk; the processes that farmers went through when making a major decision following the application of information and knowledge; and assesses the level of satisfaction of the outcome; and the differences between individual farmer decision making and group decision making. Additionally, this Chapter presents and interprets findings on the sufficiency of the knowledge and information for the needs of farmers, how farmers addressed information gaps, and constraints or problems encountered in accessing agricultural information and knowledge. Finally, it identifies the main problems and constraints that small-scale farmers encountered in accessing agricultural information and knowledge. Data for this Chapter was collected through in-depth interviews with individual farmers, information providers, key informants, GoK, education institutions, research organisations, the private sector and civil society representatives, focus group discussions with farmers' groups as well as the RAAKS window on knowledge network analysis.

## 10.1 Types of information and knowledge obtained from major sources

This section responds to the **research question 4.1: *What types of information and knowledge do farmers obtain?*** The section presents and interprets findings on the types of information and knowledge that farmers obtained from key actors in the AKIS, the frequency of use, the importance attached to key sources, as well as the application of the knowledge and information. Information was categorised into five main types namely operational, technical, marketing, policy and strategic. Different types of information were used depending on the specific need at the time of seeking information and knowledge. In addition to the top three sources that are presented and discussed in depth, farmers' groups are given special attention because of their importance in this study. Salomon and Engel (1997b) advanced the following definitions of types of information (see **section 4.7.4.1**): i) Strategic information relates to information that is used for making decisions and for addressing tactical issues. ii) Operational information is concerned with information required by farmers for their daily farming operations. For example, how to plant sweet potato vines, how to pluck tea or how to train passion fruit. iii) Technical information pertains to information that guides farmers on good husbandry practices, farming systems, pest and disease control and management, spacing of

carrots, mixing of agrochemical, or quantities of fertilisers to use. iv) Policy information refers to information about rules and regulations in the agricultural sector in its broadest sense. v) Market information is concerned with information on markets, prices, supply and demand and market trends. vi) Awareness information relates to information that alerts farmers about new products, services, breeds, technologies, markets, varieties, opportunities and threats and increases the understanding of farmers.

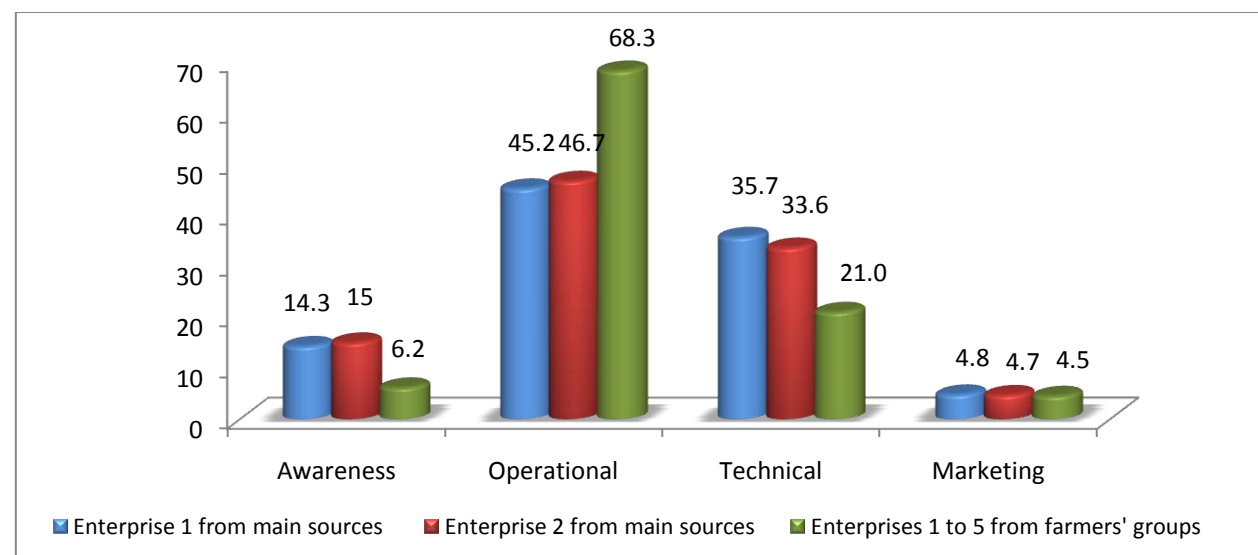
To establish the types of information obtained from major sources, farmers' groups and individual farmers were asked to state the type of information they obtained from each of their main sources. Results showed that farmers obtained different types of information depending on their farming objectives, enterprise(s) and the purpose for which the information or knowledge was needed.

### 10.1.1 Types of information obtained by farmers' groups

Farmers' groups obtained different types of information from key sources for different enterprises and from farmers' groups.

#### 10.1.1.1 Types of information and knowledge obtained from key sources by farmers' groups

Information used for the enterprise ranked priority number one and two by farmers' groups from key sources was largely operational in nature, while some was technical, and some was on awareness and marketing (see **Figure 50**).



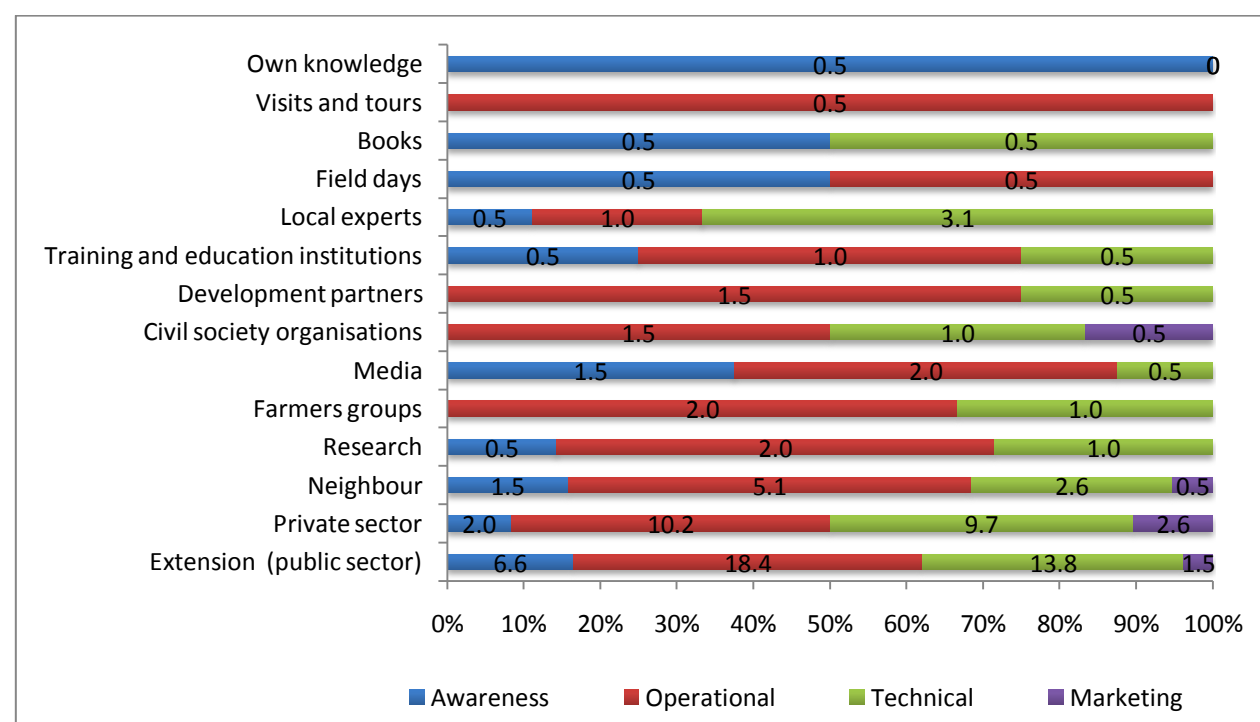
**Figure 50: Types of information obtained by farmers' groups for enterprise ranked priority number one and two from the major sources and for enterprises ranked priority number one to five from farmers' groups**

N=81 for enterprise 1, N=84 for enterprise 2, and N=68 for information from farmers' groups

Farmers' groups (N=81) mainly obtained operational information from the main sources for the enterprise ranked priority number one (57 responses, 45.2%), followed by technical information (45, 35.7%), awareness information (18, 14.3%) and marketing information (6, 4.8%). The information used from each major source was further classified by type of information under broad agricultural themes (see **Appendix 121**). Overall, the results showed that farmers' groups mainly used information on plant husbandry, followed by animal husbandry for the enterprises ranked priority number one and two from the main sources of information and knowledge. The results showed that:

- i) From extension, farmers' groups obtained information on crop / animal husbandry, pests and diseases, agrochemical application, good practices, breeds and seed / seedling varieties, markets and price information.
- ii) The private sector provided farmers with information on agrochemical application, crop husbandry, pests and diseases, good varieties, markets and prices, seeds, fertilisers and manures.
- iii) Farmers used information on crop / animal husbandry, pests and diseases, markets and prices, agrochemical use and application, good breeds and varieties from neighbours.

**Figure 51** illustrates the types of information obtained from each major source of information and knowledge for the enterprise ranked priority number one.



**Figure 51: Types of information obtained by farmers' groups from each of the main sources for the enterprise ranked priority number one**

N=81

The findings for specific sources confirmed the general findings obtained above (see **Figure 50**).

Findings on the types of information obtained by farmers' groups (N=81) from the top three specific sources of information and knowledge showed that (total percentages):

- i) From extension, farmers' groups mainly obtained operational (36, 18.4%), technical (27, 13.8%), followed by awareness (13, 6.6%) and very little marketing (3, 1.5%) information.
- ii) The private sector mainly provided operational (20, 10.2%), followed by technical (19, 9.7%), marketing (5, 2.6%) and awareness (4, 2.0%) information.
- iii) From neighbours, farmers' groups mainly obtained operational (10, 5.1%), technical (5, 2.6%), awareness (3, 1.5%) and marketing (1, 0.5%) information.

The three sets of data showed that farmers' groups mainly obtained operational information and used very little market information from the main sources of information and knowledge (see **Figure 50**, **Figure 51** and **Appendix 121**). For example: i) only 6 (4.8%) farmers' groups indicated that they obtained market information for the enterprises ranked priority number one from the main sources (see **Figure 50**). Findings on the types of information obtained by farmers groups from each of the main sources for the enterprise ranked priority number one showed that 1 group (0.5%) obtained market and price information from neighbours, 5 (6%) from the private sector, 1 (0.5%) from CSOs and 3 (1.5%) from extension (see **Figure 51**). Although most market information used by farmers' groups came from the private sector, this was only 2.6%. These findings suggest a gap in marketing and market information from the main sources of information and knowledge in the system.

#### **10.1.1.2 Information and knowledge obtained for the enterprises ranked priority number one to five by farmers' groups from their group**

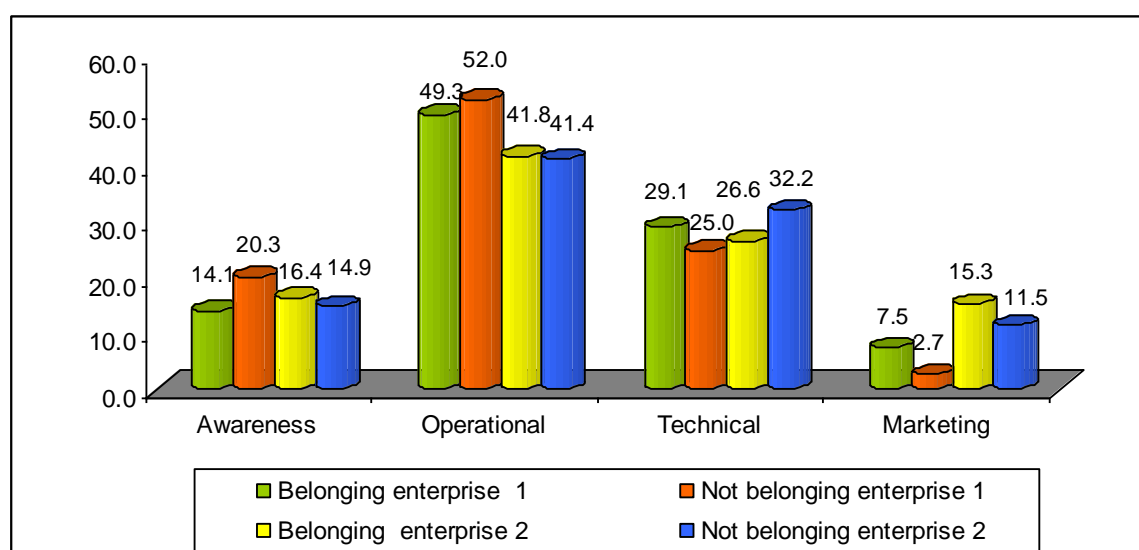
Farmers groups were asked to state what information they obtained for the enterprises ranked priorities number one to five from their farmers' group (N=68). The results tallied with those obtained for the enterprises ranked priority number one and two from key sources, and showed that most of the information obtained from their groups was operational in nature (166 responses, 68.3%) (see **Figure 50**). Only 51 responses (21%) indicated it was technical, 15 (6.2%) awareness and a meagre 11 (4.5%) was on marketing. Although farmers' groups provided market information to members, the information obtained was limited. The low percentages of market information obtained from key sources in the system pointed to the need for repackaging appropriate, timely and relevant market information that met the needs of farmers.

Results on the types of information obtained by group members for the enterprises ranked priority number one to five from the farmers' group by broad agricultural themes showed that the group members obtained information for about 34 different enterprises on a wide range of topics including plant husbandry (174 responses, 71.9%), animal husbandry (36, 14.9%), marketing and price

information (9, 3.7%), and fertiliser use and application (6, 2.5%). Group members also obtained information on pests and diseases, seeds and seedling varieties, value addition, tree and fruit tree nurseries, agrochemical use and animal feeds (see **Appendix 121**). The findings showed that farmers obtained fewer types of information from their farmers' group than from the major sources of information and knowledge.

### 10.1.2 Types of information obtained by individual farmers

Findings from individual farmers belonging and not belonging to a group for the enterprises ranked priority number one and two from main sources of information were in harmony with those obtained for farmers' groups. Most of the information used from key sources was operational, followed by technical and awareness then marketing respectively (see **Figure 52**).



**Figure 52: Types of information obtained by small-scale farmers for the enterprises ranked priority number one and two from key sources**

N=96 for farmers belonging to a group for the enterprise ranked priority number one, N=86 for the enterprise ranked priority number two; N=68 for farmers not belonging to a group for the enterprise ranked priority number one, N=54 for the enterprise ranked priority number two

#### 10.1.2.1 Types of information and knowledge from specific sources by individual farmers

Farmers belonging and not belonging to a group obtained different types of information from specific sources of information for the enterprises ranked priority number one and two (see **Appendix 122** to **Appendix 127**).

#### 10.1.2.1.1 Farmers belonging to a group

Findings on the types of information, advice and knowledge obtained by farmers belonging to a group from each major source of information for the enterprise ranked priority number one established that (see **Appendix 122**):

- i) Farmers mainly obtained operational information from extension (73, 50.7%), followed by technical (42, 29.2%), awareness (21, 14.6%), and marketing (8, 5.6%) information.
- ii) From the private sector, farmers obtained slightly more technical information (45, 39.5%) than operational (43, 37.7%), then awareness (18, 15.8%), and marketing (8, 7%) information.
- iii) From neighbours, farmers belonging to a group obtained operational (30, 40.5%), technical (25, 33.8%), awareness (11, 14.9%), and marketing (8, 10.8%) information.

An examination of the top three sources obtained by farmers belonging to a group for the enterprise ranked priority number one by broad agricultural themes revealed that:

- i) From extension, farmers mainly obtained information on agriculture in general (44 responses, 8.6%), pests and diseases (20, 3.9%), agrochemical application (17, 2.7%), good agricultural practices (9, 1.8%), and markets and price information (8, 1.6%).
- ii) From the private sector, farmers used information on agrochemical application (27, 5.3%), crop and animal husbandry (23, 4.5%), pests and diseases (19, 2.9%), markets and prices (8, 1.6%), fertilisers (7, 1.4%) and seeds (5, 1%).
- iii) From neighbours, farmers mainly received information on crop / animal husbandry (17, 1.2%), pests and diseases (12, 2.3%), markets and prices (8, 1.6%), and agrochemical use and application (7, 1.4%).

Results on the main sources of information and knowledge for the enterprise ranked priority number two by farmers belonging to a group (N=96) (see **Appendix 123**) corroborated the findings obtained for the enterprise ranked priority number one (see **Appendix 121**).

#### 10.1.2.1.2 Farmers not belonging to a group

The types of information that farmers not belonging to a group (N=68) used from each of the main sources of information and knowledge for the enterprise ranked priority number one are presented in **Appendix 125**. The types of information obtained from the top three sources were:

- i) From extension, farmers not belonging to a group mainly obtained operational information (40, 54.8%), technical (19, 26%), awareness (14, 19.2%) and marketing (18, 5.9%). It was noted that farmers in this category did not get any marketing information from extension.
- ii) From neighbours, farmers not belonging to a group accessed operational (35, 52.2%), technical (19, 28.4%), awareness (12, 17.7%), and marketing (1, 1.5%) information.

- iii) From the private sector, farmers obtained operational (28, 45.9%), technical (19, 31.1%), awareness (12, 19.2%) and marketing information (2, 3.3%).

The findings obtained for the types of information used by farmers not belonging to a group for the enterprise ranked priority number one (N=68) by broad agricultural themes for the three main sources revealed that (see **Appendix 126**):

- i) From extension services, farmers mainly obtained information on agriculture (19, 39%), crop husbandry (18, 5.9%), good agricultural practices (10, 3.3%), pests and diseases (6, 2%), agrochemical use (6, 2%) and fertilisers use and application (6, 2%).
- ii) From neighbours, other farmers, relatives and friends farmers mainly obtained information on agriculture (19, 39%), crop husbandry (13, 4.3%), good agricultural practices and agrochemical usage (10, 3.3% each), pests and diseases (9, 3%), seeds, agrochemical use (6, 2%), fertiliser use and application (5, 1.6%), and soil sampling and fertility (4, 1.3%).
- iii) From the private sector sources, farmers not belonging to a group obtained information on crop husbandry (19, 6.3%), agrochemical use and good agricultural practices (10, 3.3% each), agriculture (7, 2.3%), soil sampling and analysis (4, 1.3%) and animal health (3, 1%).

Findings on the types of information used by farmers not belonging to a group (N=54) for the enterprise ranked priority number two (see **Appendix 126**) were similar to those obtained for the enterprise ranked priority number one, and for farmers' groups (see **Appendix 127**) and farmers belonging to a group for enterprise two (see **Appendix 124**).

#### **10.1.2.2 Types of information and knowledge obtained by individual farmers from farmers' groups**

##### **10.1.2.2.1 Farmers belonging to a group**

Farmers belonging to a group (N=74) mainly obtained technical information (47, 36.2%), followed closely by operational (40, 30.8%), marketing (32, 24.6%) and awareness (11, 8.5%) for the main enterprises produced from their groups. An analysis of the types of information used by broad agricultural theme revealed that farmers belonging to a group (N=74) mainly used information on plant husbandry and marketing and prices (31, 23.7% each), agriculture (19, 14.5%), pests and diseases (11, 8.4%), animal husbandry (9, 6.9%), seeds and seedling varieties (8, 6.1%) and agrochemical use (7, 5.3%) from their farmers' group. Other types of information obtained from the group included breeding, soil sampling and analysis, fertiliser use and application, sources of credit, fruit and trees nursery, value addition, farm management and group management (see **Appendix 127**).

#### 10.1.2.2.2 Farmers not belonging to a group

Only three farmers not belonging to a group indicated that they used information from farmers' groups and this information was mainly operational (2, 66.7%) and technical information (1, 33.3%) in nature.

The main types of information used by farmers' groups, farmers belonging and not belonging to a group were operational, technical, awareness then marketing. The findings on the key type of information used were consistent with results obtained by Rees *et al.* (2000:10) which depicted the main type of information used in four districts in Kenya (Homa Bay, Kiambu, Trans Nzoia and West Pokot) as mainly operational, but differed for subsequent types of information, whereas the present study showed technical as the second type of information used followed by awareness then marketing. Rees *et al.*'s (2000:10) findings showed that awareness information was the second type of information, followed by technical and marketing respectively. Focusing on a specific enterprise, Zhao, Zhang and Klein (2009) found that dairy farmers in Mongolia mainly used policy (73%) and marketing information (64%), followed by technical (38%), and other types (24%) of information.

The findings of the present study showed that the type of information used depended on the need for which information was required, and the specific source used by the different categories of farmers, as well as the stage at which the farmer was on the production to consumption continuum. The study findings showed that farmers belonging to a group mainly used operational information from extension and neighbours, but used information that was slightly more technical from the private sector sources. The trend was, however, different with the types of information obtained by farmers from their groups, which was mainly technical, followed closely by operational, then marketing and awareness. In contrast, very few farmers not belonging to a group obtained information from farmers' groups. This finding suggests that although farmers' groups provided good linkages to different sources of information and knowledge, these benefits mainly accrued to members of the group. However, regardless of the information type used, farmers needed improved access to the different types of information because they were all important and served a particular need in the decision making processes of farmers and their farming activities.

It was surprising that although farmers mentioned the need to add value to their produce in order to maximise profits by selling finished or near finished products, there was very little usage (1, 0.8% for farmers belonging to a group) of value addition information. This finding showed that farmers were marketers of raw materials as opposed to finished goods. This could also have meant that information on agroprocessing was not available or that farmers did not use post harvest information. This finding suggests the need to sensitise and train farmers on the importance of adding value to their produce to improve their economic returns. As noted by UNECA and AU (2009:133) linkages



between the agricultural and the manufacturing sector were weak and information on agroprocessing was inadequate. This finding points to the need for producing simple information packages on value addition of the key enterprises produced by small-scale farmers.

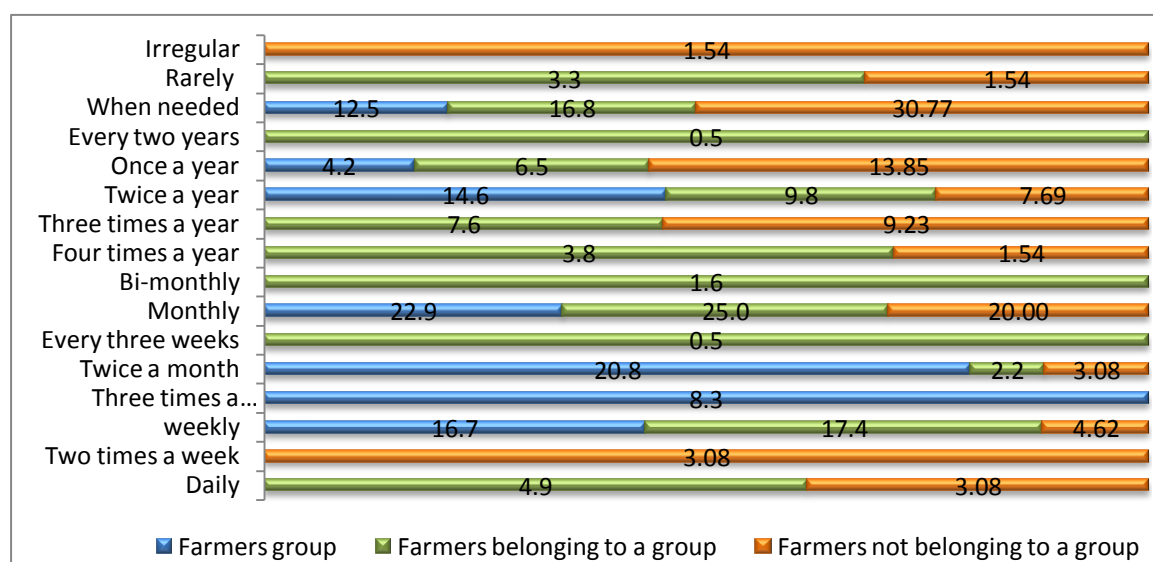
Although the usage of market information was low among all categories of farmers, it was important for strengthening the business acumen for farmers' groups and individual farmers, and in making production and marketing decisions such as in knowing what to produce, where to sell, when to sell and finding market prices (Ferris, Engoro and Kangazi 2008:8). The low usage of technical, awareness and marketing information has implications for information providers and point to weaknesses in the AKIS. These findings suggest the need for increasing and strengthening technical, awareness, marketing and other types of information (see **section 10.2.3** ahead) to bridge the existing gaps.

## **10.2 Usage of the different types of information, frequency of use and application**

This section presents and interprets findings on the frequencies of obtaining different types of information and knowledge from the main sources in general, as well as the types of information used and their frequencies based on value and importance of sources, and the use to which farmers put the information.

### **10.2.1 Types of information and frequency of use of information from main sources**

While some farmers obtained information regularly, others were irregular and ad hoc in obtaining information. **Figure 53** portrays the different frequencies of accessing agricultural information for the enterprise ranked priority number one by the three categories of farmers. The results showed that farmers' groups and farmers belonging to a group were more regular in obtaining information and knowledge than farmers not belonging to a group.



**Figure 53: Frequencies of accessing agricultural information for the enterprise ranked priority number one by small-scale farmers**

N=48 for farmers' groups, N=95 for farmers belonging to a group and N=65 for farmers not belonging to a group

#### 10.2.1.1 Frequency of obtaining information from main sources by farmers' groups

There were variations in frequencies between the different categories of farmers and types of information and sources used depending on the type of information needed, when it was required, and the purpose for which it was needed. The frequency of accessing information was also determined by the convenience for farmers and the accessibility of the source. Most farmers' groups (N=48) obtained information on a monthly basis (11 responses, 22.9%) or twice a month (10, 20.8%) (see **Figure 53** above). Findings on the frequencies of obtaining different types of information showed that farmers' groups obtained marketing information every week, every two weeks or every month. Operational information was obtained every month, every two weeks and every week or when needed. Technical and awareness information were obtained at varying frequencies ranging from every week to when needed (see **Appendix 128**). The findings of the present study showed that some farmers' groups obtained market information within shorter intervals (one week to a month) compared to operational, technical and awareness information whose frequencies varied from one week to twice a year or when needed.

#### 10.2.1.2 Frequency of obtaining information by individual farmers

Results from farmers belonging to a group (N=95) on the frequency of obtaining information from the main sources for the enterprise ranked priority number one confirmed those obtained from farmers' groups with most farmers obtaining information on a monthly basis (46 responses, 25%), every week (32, 17.4%) or when needed (on demand) (31, 16.8%) (see **Figure 53**). Marketing

information was obtained daily, weekly, twice a month, bi-annually, annually and when needed, while operational and technical information were obtained at varied frequencies. The frequencies of obtaining awareness information ranged from daily to twice a year. The frequency of obtaining information by farmers not belonging to a group (N=65) was more irregular than farmers belonging to a group. Twenty (20, 30.8%) farmers obtained information when they needed it, while 13 (20%) accessed information once every month, and 9 (13.8%) once a year. Of the individual farmers, 16.5% of farmers belonging and 21.5% of farmers not belonging to a group sought information at frequencies of between twice a year and once a year. About one third (30.7%) of farmers not belonging to a group, 16.5% of farmers belonging to a group and 12.5% of farmers groups obtained information when needed. These findings show that a significant number of farmers did not obtain information frequently.

Wilson's information behaviour model partially explained the usage of information by farmers as the information use aspect of the model provided insights into why some sources of information were used more than others (Wilson 1999:256; 2000:53; 2006a:682; Case 2002:117-119) (see **section 3.2.3.1**). Most farmers' groups used information regularly, either monthly or twice a month or weekly, while most farmers belonging to a group obtained information on a monthly basis or weekly basis. As presented in **section 6.4.7**, this was likely to be because most groups met on a monthly basis while some met twice a month and every week, which was when experts were invited or training was conducted. Most farmers not belonging to a group obtained information irregularly. However, there were differences in the frequencies with which the different categories of farmers obtained different types of information. For example, the findings of the present study showed that farmers' groups obtained market information at frequencies of between one week to every month, while for individual farmers the pattern was between daily to one year or when needed.

The findings of the present study were similar to those of Zhao, Zhang and Klein (2009), who established that only a few farmers (35%) in Mongolia used information often, while 24% did not use information often, and 41% indicated they never used or they did not know the frequency of access. Although assessing the extent of usage of information and knowledge was beyond the scope of this study, the literature suggested that knowledge and information were underutilised (Aina, Kaniki and Ojiambo 1995; Harris 2004). As qualified by Kinengyere's (2007:339-340) study, usage was low where users did not know how to utilise the available resources. The findings of the present study on low frequencies of obtaining information were in agreement with Kinengyere's (2007:339-340) suggestion on the need to introduce information literacy programmes to increase usage of information. This finding points to the need for devising strategies for delivering information to illiterate and semi literate farmers. The present study also shows that some farmers did not obtain information frequently. As noted by Wilson (1997a) failure to obtain information may have resulted

from various factors including issues pertaining to accessibility of information, shortage of time because of farmers being busy with chores, non affordability of information, and uncertainty about finding the information they needed.

### **10.2.2 Types of information used and frequency of access based on value and importance of source**

Other than the types of information based on use and frequency of access, the information was further categorised into types based on value and importance of sources. Data collected using the RAAKS knowledge network analysis table of use supplemented information collected through interviews and focus group discussions with farmers' groups that are presented above. Information used by farmers in each division was categorised into five types of information namely strategic, operational, technical, policy and market (Salomon and Engel 1997b). This section presents findings on the value that was placed on the information and knowledge provided by key actors in the system and highlights important sources that were frequently used. The frequencies of use were assigned numbers one to five, where one denoted not very frequently used and five very frequently used. The frequencies of use are presented in brackets. The Knowledge network analysis table of use for Kirinyaga district (see **Appendix 129**) summarises the main sources of information and the types of information obtained from different actors in the four divisions and the frequencies of use. The findings demonstrated the diverse sources used and their frequencies of use and highlighted gaps in information that was required in the AKIS of Kirinyaga district.

Dwelling on the three most important sources identified in **section 8.1**, and the types of information obtained from each source, extension emerged as a very important source that was strong<sup>80</sup> in providing operational and policy information, but was perceived to be average on strategic information and weak on market information (see **Appendix 129**). The private sector information depended on specific sources. For example, some stockists were perceived to be important in providing technical and operational information while others provided all types of information. Neighbours were perceived to be strong in operational and market information but weak on the provision of technical and policy information. The frequencies of use varied between the different types of information used in each division. Media and especially radio information was perceived to be strong in policy and market information and the source was frequently used. The DGAK was perceived to be very strong in market information on dairy kids and goats and farmers frequently accessed the source, while coffee societies were strong in providing market information. Training and education institutions were perceived to be strong in providing technical and operational information, average for strategic information and weak in policy and market information. The

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<sup>80</sup> Very strong, strong, average and weak were gathered from field notes based on the discussion and evaluation of sources by the RAAKS study team.

knowledge network of use depicted transporters as strong in market information (see **Appendix 129**). Findings on specific types of information and knowledge obtained from each division are presented in **Appendix 130 to Appendix 133**. The ensuing discussion on the main sources and types of information farmers obtained from each source and their frequencies of use is presented in **Appendix 134**.

The findings of the present study on the types of information used and the frequency of access based on value and importance of extension were fairly uniform across the four divisions. Extension was seen to be an important source providing policy, operational and technical information but weak in market information. The private sector sources such as horticultural exporting companies depicted slight variations and while they were perceived to be an important source in providing operational (4), marketing (4), technical (3) and policy (3) and strategic (3) information in Gichugu division, in Mwea they were considered important in providing operational, technical, market and policy. In Ndia, horticultural exporting companies were perceived to be an important source providing operational (4), technical (4), market and strategic information (3 each), but weak on policy information.

The findings for neighbours as sources of information showed variations in the different divisions. For example, the Knowledge network analysis table of Central division showed that extension was considered an important source and strong in operational, technical and policy (5 each) as well as strategic information. In Central division, neighbours were perceived to be of average importance in providing operational (3) and market information (3). In contrast, neighbours were perceived to be very important in Mwea division and provided operational (5), marketing (4) and technical information (3), while Gichugu division considered neighbours to be an important source for market (4) and strategic (3) information. A similar trend was observed for the types of information obtained from the private sector based on the value and importance of the source. The variations may be explained by Fountas *et al.*'s (2006:197) assertion that the use of strategic, tactical or operational information by farmers was determined by the type of decision farmers needed to make or the nature of the problem they needed to address. For example, if farmers needed to maximise yields, they would need to make strategic decisions, which would require the use of strategic information.

Wilson's model, which factored in personal variables and modes of information seeking partially explained the findings of the present study on varied frequencies of use of the different types of information from a variety of sources. The model helped to explain why some sources were used more than others (risk reward theory) and based on their personal understandings of their own effectiveness (Case 2002:118-119; Wilson 2005:31-35; 2006a:682). The higher frequency of use of some sources demonstrates the importance and value of information obtained. Where farmers' needs

were satisfied, that reward or gain created a new need, which affected the individual's information seeking behaviour and motivated the farmer to seek and use more information.

### 10.2.3 Use made of key sources of information based on application and frequency of use

In addition to the value and importance of information, the types of information farmers used were classified into four categories based on how the information was applied such as for image or opinion formation, determination of needs, comparison of alternatives and implementation of solutions. The study adopted the meanings advanced by Salomon and Engel (1997b).

- Image formation was used to denote the application of information that helped farmers to keep abreast with what their peers were doing.
- Determination of client's needs related to identifying problems or needs that required interventions.
- Comparison of alternative solutions pertained to information that facilitated users to evaluate other possible options.
- Implementation of a selected solution or intervention related to information that facilitated the execution of an intervention or solution.

This section presents and interprets findings based on the knowledge network analyses of sources and illustrates the different types of information based on the use to which the information obtained was applied in the four divisions. The frequencies of use were assigned numbers one to five, where one denoted not very frequent and five very frequent. The frequencies of use are presented in brackets. In addition to the value and importance of information, the types of information farmers used were classified into four categories based on how the information was applied such as for image or opinion formation, determination of needs, comparison of alternatives and implementation of solutions. The study adopted the meanings advanced by Salomon and Engel (1997b) (see **section 4.7.4.1**). Findings on the Knowledge network analyses of use make of key sources in the four divisions are presented in **Appendix 135** to **Appendix 138**. The following section presents an analysis for Central division while **Appendix 139** covers highlights of other divisions. **Appendix 140** provides examples on how small-scale farmers used external agricultural information.

**Appendix 135** presents the Knowledge network analysis table of use for Central division. Results on the type of information based on how the information was used for the top three sources identified in **section 8.2.5** indicated that:

- Farmers used extension services for image formation (4), for identification of problems or needs that required intervention (4), to help evaluate available options (4), and for implementation of solutions (5).



- Information from neighbours was used to help farmers in image formation (3), determination of problems and areas requiring intervention (3) and in choosing between alternatives (3).
- Media (especially radio) information was used to facilitate image formation (3) and determination of problems and needs that required intervention (1). The findings indicated that farmers did not rely on media information for comparing alternative solutions or for implementing a solution.

The Knowledge network analysis table on uses provided an insight into how information from important and relevant actors was applied by farmers. The findings of the present study showed that farmers used different types of information and from multiple sources. For example, the knowledge network diagrams on use for Mwea and Ndia division brought out farmers' groups as an important source that farmers used for opinion formation, identification of needs and for implementing a solution. The Central division diagram indicated that farmers did not rely on media information for comparing alternative solutions or for implementing a solution.

There were complementarities in data collected using different methods. For example, the Knowledge network analysis on use did not highlight research and NGOs as key sources in Ndia, which were identified as key sources for advice, information and knowledge through focus group discussions with farmers' groups and through individual interviews with farmers (see **section 8.2.5**). This finding demonstrates the benefits of mixing methods and underscored Wilson's (2006a:681) assertion on the importance of triangulation in tackling complex studies. Using Wilson's (1999) model to explain this phenomenon, this finding showed that the manner in which information was applied depended on the situation and the environment in which farmers operated, hence the sources used were different among farmers. This finding underpinned the importance of having a big sample and triangulating data collection methods to address subjectivity and ensure that richer and deeper data was captured.

### 10.3 Farmer decision making

As discussed in **section 4.7.4.2**, farmers faced risks in their farming activities because the livelihoods of their households were dependent on what and how much they produced. This section presents and interprets findings on the **research question 4.2: *How do farmers make decisions that deal specifically with risk?*** The section focuses on how farmers used agricultural knowledge and information to make decision(s), solve a problem or innovate, and improve understanding. Additionally this section assesses the level of satisfaction with the decision making or innovation or solving a problem(s) improving understanding. The decision making processes focus on the micro moment steps in time and place in decision making processes by farmers, the feelings and emotions that farmers experienced when deciding on what agricultural enterprise(s) to adopt, innovation or

problems solved (Dervin 1998:36; 2005:28). Data answering the research questions under this objective was collected through interviews with farmers' groups and individual farmers using Dervin's Sense making interviewing technique (see **sections 3.2.2.1** and **section 5.1.5**).

### **10.3.1 How farmers make decisions that deal specifically with risk**

The introduction of new enterprises is often a complex endeavour to farmers and the decision making process is further complicated by resource constraints. Farmers' groups (N=80) narrated instances and the feelings they experienced when they made major decisions about agricultural enterprises in space and time (see **Appendix 141**).

*Example one:* One group decided to produce French beans because there was a reliable market for the product. The group members explained that they had many questions. For example, some asked, "Will Nicola Company help us to market our produce? How reliable was Nicola?" After exhaustive discussions, the group officials decided to contact the company (Nicola) to seek answers to their questions. Nicola responded to the questions asked and offered to train the farmers. The group thus decided to adopt French beans production.

*Example two:* Another group deliberated on what enterprise to adopt and after discussing among themselves, they had many questions about the dairy goat enterprise. "What enterprise shall we adopt? If we adopt dairy goat farming how shall we go about it? How much milk shall we get?" The group decided to visit a dairy goat group in Mukurweini, and members were very impressed by what they saw and learned a lot. Thereafter, they sought and obtained more information from DGAK and the Ministry of Livestock Development, before they settled on the keeping of dairy goats and the buying of a Toggenburg buck as their starting stock.

Farmers posed many questions in relation to markets and prices (28, 18.8%), where they would acquire skills, information and knowledge on the enterprises (24, 16.1%), where they would get capital and inputs and whether they had enough land for the enterprise (22, 14.8%). Others asked questions pertaining to how much income the enterprise would generate or on profitability of the enterprise (19, 12.8%). Others were uncertain and wondered what to produce (13, 8.7%), how to reduce poverty, improve livelihoods and ensure food security (3, 2%), while some asked questions that were not related to farming activities (40, 26.8%). A scrutiny of the questions that farmers' groups asked themselves in connection with farming at the time of making the decision revealed that the questions pertained to the choice of enterprise, crop or animal husbandry, markets and prices, increased yields / farming methods, high income / profits, production resources, food and nutrition, soil and environment conservation, credit and microfinance and information and knowledge (see **Appendix 142**).



The Sense-making theory (see **section 3.2.2.1**), which is rooted in the social constructivist paradigm (see **section 3.1.2.1**) as well as the Cynefin framework (see **section 3.2.5**), which is based on the Complexity theory (see **section 3.2.4.4**) helped to interpret the findings on decision making by small-scale farmers. As explained in **section 4.7.4.2** decision making is a subset of problem solving, and decisions made by small-scale farmers were dependent on the external information which they used (Kaniki 1989:84), local knowledge (Nyumba 2006), the prevailing environment, opportunities and constraints they faced (Shibanda 1999), and the mental reference models possessed by the farmers (Wiig 2003). Findings of the present study, as did Van den Ban's (1998:56-57), established that farmers' groups made important decisions pertaining to adoption of technologies, management of the technologies, combining resources, human resource management and knowledge and information. In addition, the groups made decisions related to marketing of agricultural produce.

Basing the interpretation of how farmers' decision making processes nested within the Sense-making metaphor of situation, gap, outcome (Foreman-Wernet 2005; Tidline 2005:113,115), the two examples above demonstrate the different situations and positions that the farmers' groups were in, their experience, constraints, barriers and skills. The main processes involved in decision making confirmed those outlined by Rausch (2001) and Failing, Gregory and Harstone (2007:56), of identifying the issue; generating alternative options and seeking additional guidance on resources and expertise required and the benefits and consequences of each strategy; choosing the best strategy based on expected benefits, available resources and constraints; and developing an action plan. However, as explained in **section 4.7.4.2**, some groups, such as the FFS groups producing vegetables in Kenya based their decision making process on the agroecosystem analysis processes (Williamson *et al.* 2003:193-194). The study findings showed that the farmers' groups had gaps in knowledge pertaining social, economic, human capital and knowledge and information aspects. Some of the gaps included questions and confusion regarding the choice of enterprise to adopt, marketing of produce, reliability of exporters and production and productivity of enterprise.

The emerging themes from the types of questions asked included questions pertaining to suitability of the area such as what enterprise would do well in their areas, economic factors such as income generated and production resources factors such as capital, land and labour, social factors such as poverty reduction, improved livelihoods, human capital factors such as skills, and information and knowledge base factors such as where to get information and knowledge. Earlier, Fox *et al.* (1994:391,397) established that decision making processes by farmers on farming practices was based on the social and economic characteristics of the farmers such as labour availability, wealth position and membership in the community.

Farmers made different types of decisions including strategic, tactical, operational (Van den Ban 1998) and technical (Solano *et al.* 2001:182). What emerged from the two examples above was that farmers made strategic decisions such as what enterprise to produce, tactical decisions such as how much milk they would get and operational decisions such the rearing of dairy goats. Understanding the decision making processes would help guide the communication efforts of information providers within an AKIS, provide guidance on what information to repackage and how to repackage it.

### **10.3.2 Feelings and emotions of farmers on agricultural enterprise(s)**

To understand the micro moment time line steps, farmers' groups, farmers belonging to a group and farmers not belonging to a group were asked to describe the feelings they experienced in connection with the decisions they made at the time of deciding on agricultural enterprises. Dervin's Sense-making interviewing technique provided the approach to understanding the feelings and emotions of different farmers (see **section 5.1.5**).

#### **10.3.2.1 Farmers' groups**

Most farmers' groups expressed feelings of happiness with the decision they made on agricultural enterprises and the returns they obtained. Many groups were happy with the returns. A few were disappointed because of the high cost of inputs and the low market prices, others experienced feelings of confusion, despair and uncertainty. For example, some groups stated, "We have not agreed yet," showing that at times it took several meetings to arrive at group consensus. Others said, "We are disappointed because the cost of feeds has gone up so much that there are no profits," "We felt demoralised because there was no market for sunflower," "We are thinking of exploring a different enterprise," "We were not satisfied but there was no alternative" and "If we get the right variety we shall still grow sweet potatoes." In connecting to life, this response showed the willingness of groups to continue producing sweet potatoes if provided with an improved variety. When farmers' groups (N=76) were asked whether the feelings had changed the group in any way, 52 (68.4%) answered yes while 24 (31.6%) answered no. Although almost one third answered no, suggesting that a significant number of groups were not satisfied with the decision they made on the enterprise, some of the feelings expressed such as "We are thinking of exploring a different enterprise" and "If we get the right variety we shall still grow sweet potatoes," demonstrated the willingness of groups of trying to find a better solution. On the other hand, one group had despaired "We were not satisfied but there was no alternative."

Farmers' groups (N=56) indicated that the feelings had made some group members become more active and dedicated to the group activities, others adopted good agricultural practices and improved crop varieties and animal breeds. Some groups increased the acreage of crops, or expanded their farming activities. One group stated, "Our plan is that each member keeps more than ten grade

cows.” Others looked to alternative markets, while some said that the positive feelings had strengthened the unity, trust and cohesiveness of the group. A group remarked, “The feelings helped members to exchange ideas for growing different enterprises.”

However, some groups indicated that the decision on the enterprise(s) to produce had led to feelings of disappointment, which had led to despair and threatened the unity of the group. One group stated, “We have become very cautious because of the bad experience we had of producing mushrooms and not finding a market.” Another group remarked, “The group members were disillusioned and many members have left the group.” Others had lost income and decided to abandon the enterprises they adopted altogether while some persevered on. One group said, “We have not given up and we would like to expand and diversify the enterprises,” and another “We did not despair but looked for another buyer for our TCB.”

Some farmers’ groups had trouble in arriving at the decision about the enterprise. For example, one group indicated that the cost for AI services was too high for group members. The challenge of high costs of inputs applied to other groups that perceived the cost of inputs to be too high. Some did not know where to get information, knowledge and materials to implement activities pertaining to the enterprise(s) selected. Others did not know where to market their produce hence were reluctant to decide on the enterprise. Some groups cited difficulties in convincing group members to adopt the enterprise suggested, and while some members were pessimistic, others were uncooperative or brought about conflicting religious values. Others found it difficult to decide because they could not get information providers to enlighten them about the enterprises.

#### **10.3.2.2 Farmers belonging to a group**

Farmers belonging to a group (N=95) expressed different feelings or emotions in connection with decisions they made regarding choice of agricultural enterprise(s). While some were happy and satisfied, others were disappointed and unhappy with the decision they made. For example, one happy informant stated that he had inherited coffee on the farm and had adopted TCB, which had earned him good income because coffee was no longer profitable. Another farmer who had adopted the dairy cow enterprise was happy because the enterprise earned him income on a daily basis. One informant who was not happy with his decision remarked: “I felt like stopping farming as I was dissatisfied with the poor market / low prices for produce and the high cost of inputs.” For other feelings or emotions of satisfaction or dissatisfaction, see **Appendix 143** and **Appendix 144**. Farmers belonging to a group used words such as motivated, happy, satisfied, eager, wish, as well as a bit satisfied and wonder to describe their feelings or emotions in connection with the decision about the choice of enterprise(s). The feelings or emotions of satisfaction or dissatisfaction were linked to income generation, improved livelihoods, good markets and prices, access to: services, information

and knowledge, production resources and inputs, while emotions and feelings of dissatisfaction were linked to poor markets and prices, income generation and livelihoods.

Small-scale farmers belonging to a farmers' group (N=93, 136 responses) were asked to state the questions they had at the stage of deciding about the enterprise(s). Four (4, 28.2%) indicated that they were uncertain about farming and were not sure what enterprise(s) to produce at the time of deciding. Thirty eight (38, 26.8%) asked questions pertaining to income generation or profitability, while 20 (14.1%) had queries about production resources, inputs and suitability of the area and climate. Others wondered where to acquire skills, information or knowledge (17, 12.0%), about the availability of markets and good prices (16, 11.3%) and how to improve their livelihoods, ensure food security or reduce poverty (11, 7.7%) (see **Appendix 145**).

When asked whether the feelings had changed the farmers belonging to a group (N=98), 74 (75.5%) answered yes, while 24 (24.5%) answered no. Those who answered yes explained that the feelings made them find information and knowledge that helped them to decide to adopt new / diversify enterprises, improve their standards of living, improve understanding, farming and yields, and adopt farming as a business. One informant explained that the feelings made him lease a water pump to irrigate French beans, while another narrated how his living standard had improved because of adopting dairy cattle, which provided food and income to meet the needs of the household.

**Appendix 146** presents additional ways in which the feelings changed farmers belonging to a farmers' group.

#### **10.3.2.3 Farmers not belonging to a group**

Fifty seven (57, 83.8%) farmers not belonging to a group (N=68) expressed feelings of happiness and satisfaction with the decision they made, while others expressed dissatisfaction. Some farmers who decided to embark on French bean growing felt that the enterprise would generate good income, or those who embarked on dairy cattle felt it was a good enterprise because it generated monthly income. On the other hand, some of the farmers who adopted coffee felt disappointed and while some decided to wait and see if the prices would pick up, others were demoralised and felt they should uproot the coffee and adopt alternative enterprises such as dairy cattle to generate additional income (see **Appendix 147** and **Appendix 148**).

Most farmers not belonging to a group (57, 83.8%) explained that they experienced feelings of happiness and satisfaction, while 11 (16.2%) experienced feelings of disappointment, dissatisfaction and uncertainty in connection with the decisions they made. Informants who were happy used words such as motivated, good, happy, satisfied and eager to describe their emotions and feelings. As was the case of farmers belonging to a group, their feelings were linked to income generation, improved

livelihoods, provision of food and ensuring food security, availability of good markets and prices, ownership and sustainability (see **Appendix 147**). The feelings of satisfaction were similar to those expressed by farmers belonging to a group.

Responses pertaining to feelings and emotions of dissatisfaction were linked to poor markets and prices, low income earned, inadequate production resources and input resources and bad weather, access to services and information as well as ownership and sustainability (see **Appendix 148**). Some narrations of feelings or emotions of dissatisfaction, uncertainty or ambiguity included - “I feel that at some stage I will uproot some tea and plant subsistence crops so that I do not have to rely on the market for all my food.” Another informant said, “I am disappointed but feel I should wait and see if it will pick or else I will uproot the crops.” **Appendix 148** presents additional examples.

Most of the questions, confusion and uncertainties that farmers not belonging to a group (N=65) had at the time of making the decision(s) focused on income generation, profitability of the enterprise(s) (30 responses, 32.6%), improved food security and poverty reduction (26 responses, 28.3%) and uncertainties about farming and what enterprise to produce (21 responses, 22.8%). Others had questions pertaining to doubt, questions and confusion regarding production resources and inputs (7 responses, 7.6%), skills, information or knowledge (5 responses, 5.5%) and markets and prices (3 responses, 3.3%) (see **Appendix 145**).

Linked to the feelings that farmers not belonging to a group had in connection with the decisions about the choice of enterprise(s) to adopt, farmers asked themselves many questions at the time of making the decision, including what to produce, how much income the enterprise would generate, food security, poverty reduction and improved livelihoods, production resources and inputs, and markets and prices. A few farmers said that they had no confusion or questions because they had sufficient information and knowledge, which they had acquired from their parents (see **Appendix 149**). Farmers asked questions such as: What should I plant to be able to practice crop rotation? Will the crops do well? How can I manage my *shamba*? Should I produce subsistence crops for my household instead of relying on the market? How much land should I allocate for French beans? **Appendix 149** presents narrations of other questions farmers asked themselves.

When farmers not belonging to a group were asked whether the feelings they experienced in connection with the decisions changed them, 63.8% (44 responses) answered yes, while 36.2% (25) answered no (N=69). Informants that answered yes explained that the gap they earlier experienced had been bridged. For example, one informant narrated how information obtained had helped him adopt a new enterprise that helped to change his way of life and improve his household’s standard of living. Another farmer explained that information and knowledge obtained helped him to diversify

his enterprises to maize, bananas and coffee, which had enabled him buy another *shamba*. Some informants indicated that they had started farming as a business, adopted new enterprises, had gained a better understanding of land tenure and had improved their standards of living. **Appendix 150** presents more specific descriptions of how the feelings had changed the farmers not belonging to a group. Two informants cited negative feelings and one stated “The market has deteriorated. Many coffee pests are not responding to pesticides and my feelings about farming have turned negative.” In relating this response to life, the informant demonstrated the frustrations of farmers and their anxiety in having market reforms.

The findings of the present study on data collected from the two categories of farmers showed that there were more farmers belonging to a group who had confusion and uncertainties pertaining to what to produce, availability of sufficient production resources, markets and prices and skills, information and knowledge than farmers not belonging to a group. However, there were more farmers not belonging than belonging to a group, who had questions relating to income generation, profitability, food security and poverty reduction.

Backus, Eidman and Dijkhuizen (1997:307) argued that “Farmers still farm because many risky situations are also potentially profitable.” Backus, Eidman and Dijkhuizen (1997) noted that there were many uncertainties in the strategic farm management decisions made by farmers. The study findings showed that farmers made strategic decisions about the enterprise or farming practice to adopt or about switching from one enterprise that was not performing well to another that they perceived to be more profitable. As asserted by Van den Ban (1998:58), farmers had to make decisions about changes in their farming systems and practices. The findings of the present study showed that farmers experienced positive and negative feelings, but most farmers experienced feelings and emotions that helped them change as individuals and as groups.

Eckert and Bell (2005) explained that the decisions and actions of individual farmers were unique because each decision was based on their distinct workable mental models of farming, which were influenced by their unique knowledge assets they possessed, experiences, skills, values, beliefs and ways of processing information. The knowledge required in solving problems was thus subject to personal interpretation (based on one’s ideas, perceptions and experiences) and the skills and ability of an individual as opposed to a model solution that is learned (Scoones and Thompson 1994:18). These explanations provided a framework for understanding the different decisions, actions and feelings of individual farmers as presented in **Appendix 143** to **Appendix 146** that yielded individual ingenuity. The findings imply that farmers needed diverse sources of information to facilitate decision making pertaining to risk and uncertainty. For example, Little *et al.* (2000:84) and Williamson *et al.* (2003:191,193) indicated that farmers belonging to FFS in Kenya used their own

knowledge and information from group training hence used more biological and cultural methods than chemicals. On the other hand, untrained farmers relied on information from extension workers or neighbours hence mainly used pesticides. This finding suggested a need for understanding the linkages and relationships between farmers and other actors in an AKIS. For example, educators could enhance learning by basing their training on aspects linked to the values of farmers. Further, the findings suggest that small-scale farmers were not homogenous hence there was a need for understanding the perceptions of how they view their worlds in order to guide their decisions, problem solving approaches, actions and use of information. An area for further research would be to explore the different types of decisions taken and the sources of information used to inform the decision(s).

The behaviour of the few farmers who said they had no confusion or questions because they had sufficient information and knowledge could be explained by the self efficacy component of Wilson's model, which is situated in Bandura's (1977; Miwa 2005) Social cognitive theory (see **section 3.2.2.2**). These farmers perceived that they had the ability and capacity in relation to knowledge and information based on observational learning and knowledge passed on by their elders to perform their farming tasks.

### **10.3.3 Making sense of decisions farmers made on choice of enterprise(s)**

In arriving at the decision about what enterprise to adopt, farmers belonging and not belonging to a group reflected on the time line steps of situation in time and space when they made the decision; the gap they faced at that time and moment; the bridge that helped them arrive at the decision; and the outcome and impact of the decision on farming. The Sense-Making methodology and Sense-making theory (Dervin 1998; Tidline 2005:113,115; Foreman-Wernet and Dervin 2006:289; Naumer, Fisher and Dervin 2008) guided the questioning, analysis and interpretation of results (see **section 5.1.5** and **section 3.2.2.1**).

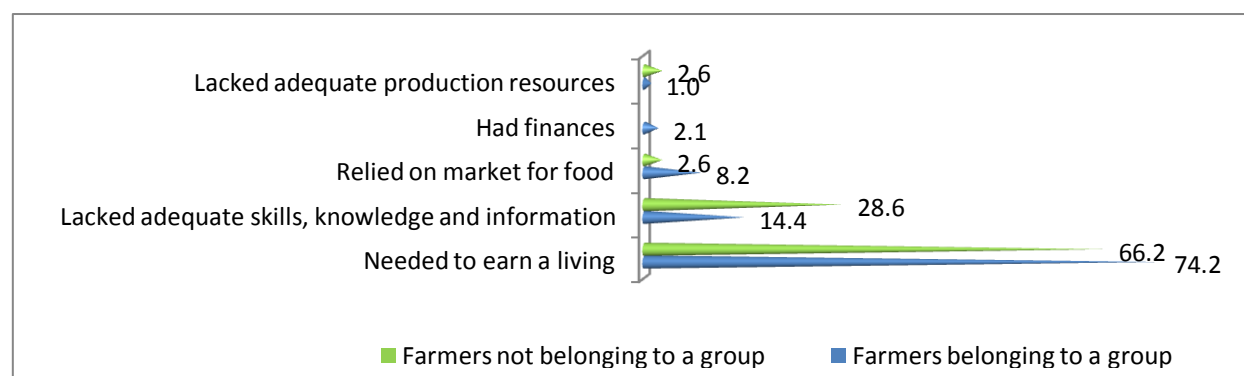
#### **10.3.3.1 The situation in time and space and gap of farmers**

The situation component of the Sense-making metaphor (Tidline 2005:113,115; Naumer, Fisher and Dervin 2008) helped to explain the situation of the farmers and their context at the time of deciding on the enterprise to produce. Responses from farmers belonging to a group (N=94 informants, 97 responses) indicated that at the time when farmers decided on the agricultural enterprise(s) they adopted, most (72, 74.2%) were in situations where they were struggling to survive and needed to earn a living. Some were poor and needed money for food and for buying agricultural inputs. Others were school dropouts, or were retired, retrenched, unemployed, casual labourers, traders, hawkers or were working but not earning enough to meet their needs. Some had married and had additional responsibilities while others were supported by their parents. Fourteen (14, 14.4%) indicated that



they did not have adequate skills, information or knowledge. Some were using local animal breeds or were producing a little food for subsistence. Others did not know how to handle diseases or where to find good markets and prices for their produce. Eight (8, 8.2%) relied on the market for food, 2 (2.1%) had access to finances to invest in farming from their cooperative and from savings, while 1 (1%) informant lacked adequate production resources. **Appendix 151** presents reflections of farmers belonging to a group on what was happening in their lives at the micro moment in time that they decided on the enterprise(s).

Findings on what was happening in the lives of farmers not belonging to a group (N=69, 77 responses) at the time they decided on the enterprise(s), were in harmony with those of farmers belonging to a group (see **Appendix 152**). However, a comparison of results of the two categories of farmers (see **Figure 54**) showed that there were relatively more farmers not belonging to a group (28.6%) who did not have adequate skills, knowledge or information than farmers belonging to a group (14.4%). A few farmers belonging to a group had access to credit (2.1%), while there was none among the category of farmers not belonging to a group. Connecting this finding to life showed that farmers belonging to groups had more access to credit to facilitate implementation of farming activities than farmers not belonging to a group.



**Figure 54: What was happening in the lives of farmers at the time of deciding on the enterprise(s)**  
N= 94 for farmers belonging to a group, N=69 for farmers not belonging to a group

There were more farmers not belonging than belonging to a group, who did not have adequate skills, knowledge or information. This was probably because the latter had access to training and information services through their groups. Likewise the finding on farmers belonging to a group having better access to credit and microfinance than farmers not belonging to a group could be explained by the benefits of groups (including cooperatives) having “merry-go-rounds” or the group’s collective collateral for loans. The findings on the situations in time and space showed that most farmers were in desperate and destitute situations and experienced gaps such as the need to earn a living, need for skills, knowledge and information, need for food and resources at specific situations

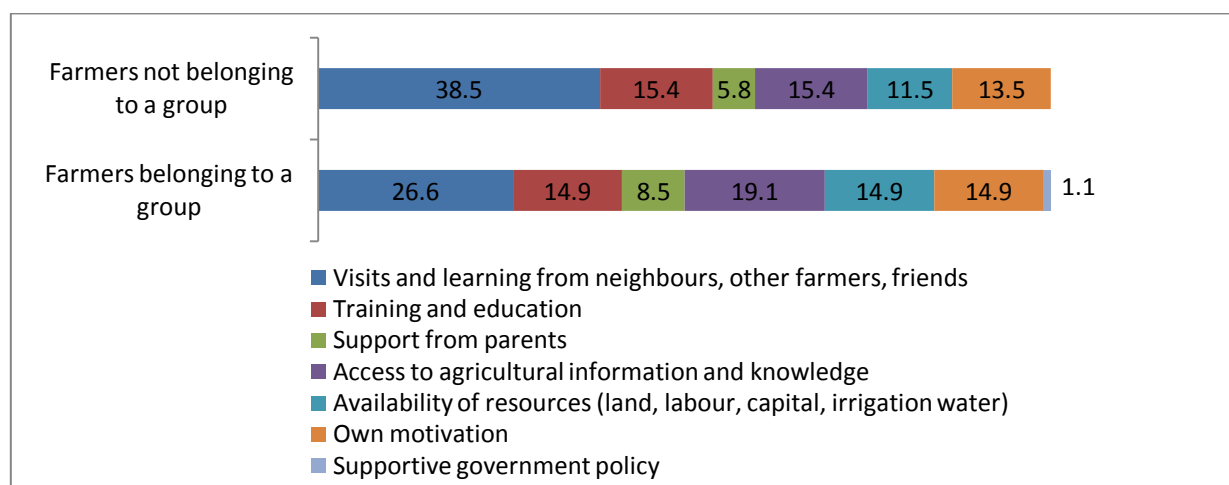


in time. A person facing a gap could be equated to a “sense-making need” (Naumer, Fisher and Dervin 2008). Gaps generated not only information needs, but also expectations (Gluck 1997:54-55). Various authors have pointed out that an individual’s life was full of gaps in knowledge and information, which changed as one moved across steps in time and space and based on the situational changes within the individual and their specific context (past, present and future, culture, communities, knowledge systems and power structures) (Dervin 1998:36; Clark 2005:2).

### 10.3.3.2 The knowledge and information that helped farmers to arrive at the decision on the enterprise

This section presents and interprets findings on **research question 4.4: *What knowledge and information helped make the decision(s) or solve the problem or innovate?*** To establish whether there was any bridge that helped farmers to arrive at the decision on the agricultural enterprise(s), farmers were asked to state whether there was anything that helped them arrive at the decision. The bridge in Dervin’s Sense-making theory metaphor was used to explain how farmers responded to the situation and gap(s) that they encountered. Eighty six (86, 88.7%) answered yes while 11 (11.3%) answered no among the category of farmers belonging to a group (N=97).

In the category of farmer not belonging to a group (N=70), 55 (78.6%) indicated that there was a bridge that helped them arrive at the decision on the enterprise, while 15 (21.4%) answered no. Results showed that there were more farmers belonging to a group than not belonging to a group who had a bridge that helped them arrive at the decision on the enterprise (88.7% versus 78.6%) respectively. **Figure 55** presents other bridges between the situation the farmers were in and the gap they experienced.



**Figure 55: Bridges that helped small-scale farmers to arrive at the decision on the enterprise(s)**  
N=71 for farmers belonging to a group, N=52 for farmers not belonging to a group

Farmers obtained information to bridge the gap by i) learning about the enterprise(s) from their neighbours, other farmers and friends and visits. For example, one farmer said, “I learned from my employee, who was growing maize.” Another said, “I participated in the tour to Wambugu farm and agricultural shows and learned about organic farming among other things,” while another explained “I saw my neighbours growing French beans and enquired about the profitability of the enterprise.” ii) Others accessed agricultural information and knowledge from key providers. For instance, one informant stated “Information obtained in a baraza on the use of organic solutions in controlling pests,” while another stated “Africa Harvest equipped us with knowledge and information on TCB before we decided on the enterprise.” iii) Some received training on the enterprise(s), iv) had access to production resources such as land, labour, capital and irrigation water respectively. One farmer said, “The intervention of CCS, Ministry of Agriculture and Njaa Marufuku Project in providing us with resources helped me arrive at these enterprises.” **Appendix 153** presents examples of other bridges that helped farmers belonging to a group arrive at the decision on enterprise(s).

Informants among the category of farmers not belonging to a group (N=52) had bridged their information gaps in similar ways as farmers belonging to a group (see **Figure 55**). A scrutiny of responses of the two categories of farmers showed that there were more informants that had learned from neighbours, other farmers and friends and visits within the category of farmers not belonging to a group than those belonging to a group (38.5% versus 26.6%). This suggests that farmers not belonging to a group preferred to use local and informal sources. However, there were slightly more farmers who had access to information in the category of farmers belonging to a group than those not belonging to a group (19.1% versus 15.4%). The specific narrations of bridges that helped farmers not belonging to a group to decide on the enterprise at that time and space are presented in **Appendix 154**.

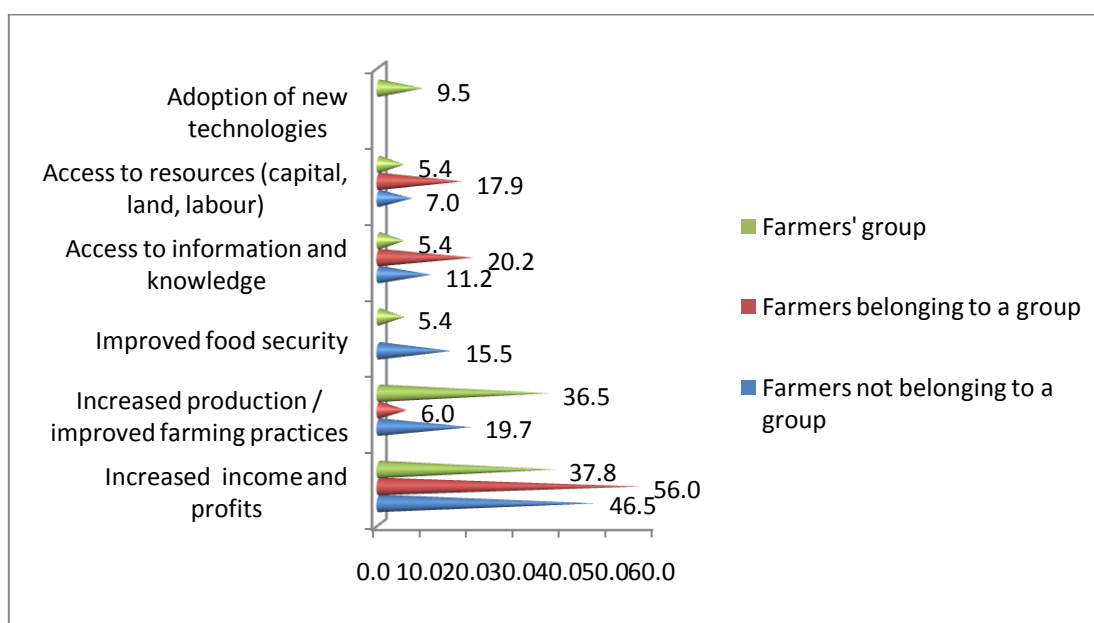
The process of bridge building entailed iterative steps of using inputs (information) and other activities through time and space (Naumer, Fisher and Dervin 2008). These findings showed that bridging the gap or appropriate decision making required timely and accurate knowledge and information (Tichá and Moulis 2004:59). Farmers were able to bridge gaps through sense-making and unmaking to attain outcomes that helped or hindered the situation (Dervin 2005b:28). The study findings showed that more farmers belonging to a group than not belonging to a group had constructed bridges over the gap between their prior situations and the desired outcome. The study findings showed that most individual farmers used sources that were easily accessible to them, and in particular farmers not belonging to a group preferred to use sources that were local and informal such as neighbours and other farmers.

### 10.3.3.3 What was the outcome

This section partially addressed the **research question 4.5: *Were farmers satisfied with the decision(s) / innovation / solution / understanding gained? If so / not, why?*** The outcome component was explained by Dervin's Sense-making metaphor, which comprises factors such helpful, facilitation, hurt, hindrance, consequences, impact and effect (Naumer, Fisher and Dervin 2008).

#### 10.3.3.3.1 What was helpful about the choice of enterprise

When asked whether the choice of enterprise(s) helped, most (84 responses, 89.4%) of the farmers belonging to a group (N=94) answered yes while (10, 10.6%) answered no. Among the category of farmers not belonging to a group (N=67), (56 responses, 83.6%) answered yes and (11, 16.4%) answered no. Both categories of farmers explained that the choice of enterprise led to increased income and profits, improved access to information and knowledge, increased production and improved farming methods and improved access to resources. Results obtained from farmers' groups (N=65) depicted a similar trend to that of individual farmers (see **Figure 56**). The findings suggest that farmers focused on enterprises that would earn them good income. Farmers belonging to a group did not cite the factor contributing to food supply and ensuring food security because most groups focused on cash crops that generated income. The specific narrations of what farmers belonging and not belonging to a group specifically found useful in the choice of the enterprise(s) in relation to farming are presented in **Appendix 155** and **Appendix 156** respectively.



**Figure 56: What small-scale farmers found helpful in the choice of enterprise(s) in relation to farming**

N=77 for farmers belonging to a group, N= 54 for farmers not belonging to a group

#### **10.3.3.3.2 What hindered farming activities in relation to decisions on enterprise(s)**

When farmers were asked whether the choice of enterprise hindered their farming activities, most (62, 83.8%) farmers belonging to a group (N=74) answered no but a few (12, 16.2%) answered yes. In the case of farmers not belonging to a group (N=59), 36 (61%) answered no while 23 (39%) answered yes. The findings indicated that the decision made on enterprises hindered the farming activities of more farmers amongst the category of farmers not belonging than belonging to a group (39% versus 16.2%). The main hindrances encountered by farmers belonging to a group (N=11) included low market prices leading to low earnings (4, 33.3%), high cost of inputs and production in general (3, 25%), high cost of labour and limited capital (2, 16.7% each), and small farm size (1, 8.3%). For farmers not belonging to a group (N=21), the main hindrances included limited production resources (capital, land, labour) (9, 42.9%), high cost of production (6, 28.6%), poor markets and low prices (5, 23.8%) and problems with pests and diseases (1, 4.8%) (see **Appendix157**).

As discussed ahead in **section 10.3.3.3**, hindrances fall under the outcomes component of the Sense-making metaphor of situation, gap, bridge and outcome (Dervin 1998:40; 2001). The findings showed that farmers not belonging to a group were more adversely affected by the decision(s) on choice of enterprise(s) than farmers belonging to a group were. This could be explained by the finding on what farmers found helpful in **section 10.3.3.3.1**. As demonstrated in **Figure 56**, farmers belonging to a group had more access to information and knowledge through their groups than farmers not belonging to a group (20.2% versus 11.2%), which enabled them to make more informed decisions. This finding implies that decisions made by farmers not belonging to a group had more adverse effects on farming activities than those made by farmers belonging to a group. As pointed out by Davenport and Prusak (2000:170), knowledge was valuable and enabled people to make improved decisions. In addition, Awad and Ghaziri (2004:36) asserted that information made decision making easier. While the main hindrances to farming activities were similar for the two categories of farmers, the weightings differed. Farmers belonging to a group put more emphasis on low market prices, high costs of inputs and small farm sizes, whereas farmers not belonging to a group stressed limited production resources, high costs of production then, low market prices and pests. In his study of agricultural knowledge systems in Fiji, Bachmann (2000:114) also identified the hindrance of high costs of agricultural inputs.

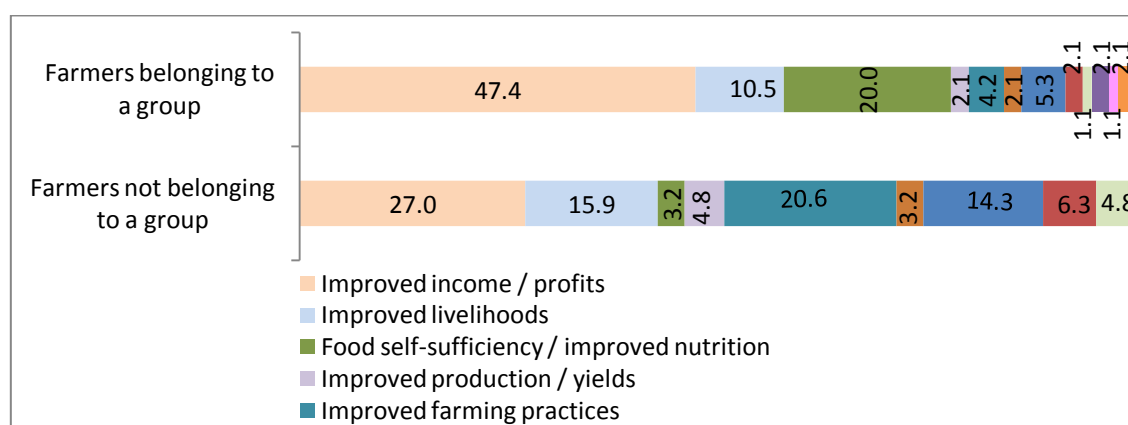
#### **10.3.3.3.3 Outcomes of the choice of agricultural enterprises on farming activities**

Farmers' groups and individual farmers were asked to state the outcomes of the choice of agricultural enterprise(s). Findings from data collected from farmers' groups (N=77) revealed that the choice of enterprise had attracted widespread participation from farmers (43 responses, 36.4%), increased knowledge, information and understanding (15, 12.7%), increased adoption of new technologies or improved farming systems (13, 10.2%). Some groups cited that it built trust among farmers (10,

8.5%), increased awareness of agricultural knowledge and marketing opportunities (8, 6.8%), enhanced a sense of community participation (6, 5.1%) and improved communication (4, 3.4%). Additional outcomes included a contribution to the change in farming practices, increased agricultural productivity, farmers secured better marketing opportunities, increased employment opportunities, obtained fuelwood and income from the trees planted, obtained seedlings to plant and that farmers were happy. Some of the negative outcomes included reduced people's incentives to farm, farmers being demoralised because there was no market, farmers abandoning the enterprise, poor performance and destruction of the enterprise by wild animals.

Farmers belonging to a group (N=73) cited both positive and negative outcomes. The main positive outcome was improved income and profits (45, 47.4%). Others included food self-sufficiency / improved nutrition (19, 20%), improved livelihoods (10, 10.5%), improved farming practices (4, 4.2%), improved knowledge, information or understanding, good markets and prices, employment created (2, 2.1% each) and the environment conserved (1, 1.1%). Some of the negative impacts mentioned by farmers belonging to a group included low production and yields (5, 5.3%), market and price fluctuations (2, 2.1%) and inadequate production factors (1, 1.1%) (see **Figure 57**). Because the Sense-making theory advocates communicating the results of what is observed in reality in “the world of the user” (Dervin 2001; Foreman-Wernet 2003:8; Naumer, Fischer and Dervin 2008), **Appendix 158** presents the specific perceived outcomes mentioned by farmers belonging to a group.

The main outcomes cited by farmers not belonging to a group (N=52) were similar to those obtained by farmers belonging to a group but there were variations in the percentages (see **Figure 57**).



**Figure 57: Outcomes of the choice of enterprise(s) by small-scale farmers**

N=73 for farmers belonging to a group, N=51 for farmers not belonging to a group

**Appendix 159** presents the specific perceived outcomes mentioned by farmers not belonging to a group. The results indicated that there were more farmers not belonging to a group than farmers

belonging to a group who cited low production or yields (14.3% versus 5.3%), poor market and prices (6.3% versus 2.1%), and inadequate production factors such as labour, capital, land and inputs (4.8% versus 1.1%).

As mentioned above, the Sense-making metaphor builds bridges using different information strategies to attain the desired outcomes in situation (Dervin 1998:40; 2001). The outcomes component of the metaphor includes helps and facilitations, hurts and hindrances (Naumer, Fischer and Dervin 2008). The study findings showed that there were positive (helpful) and negative (hindrances) outcomes of the choice of enterprise(s) by farmers' groups and individual farmers. The findings showed that there were variations in outcomes among the three categories of farmers, with more farmers not belonging to a group experiencing negative outcomes. Among the main positive outcomes of farmers' groups were: attracted widespread participation of other farmers in the community, increased understanding and increased adoption of new technologies. The negative outcomes included demotivation leading to abandonment of some specific enterprises, demoralisation due to poor markets and prices and poor performance. The key outcomes observed by individual farmers belonging to a group centred on improved profits and income, food self sufficiency and improved nutrition, and improved livelihoods, while the negative outcomes were low production, market prices and inadequate production factors. The trend was different for farmers not belonging to a group, whose major outcomes included improved profits and income, followed by improved livelihoods, and improved farming practices, while the negative outcomes corroborated those obtained by farmers belonging to a group. These findings suggest a need to devise better strategies for bridging the gaps across time and space by addressing the barriers identified.

The findings revealed that there were more farmers belonging to a group than farmers not belonging to a group who perceived that they had obtained improved income and profits (47.4% versus 27%), food self-sufficiency and nutrition (20% versus 3.2%), and better markets and prices (3.2% versus 2.1%). The finding on the low figures (10.2%) on the outcome on adoption of improved technologies was similar to those obtained by earlier studies in Kenya (Noordin *et al.* 2001:510; Franzel *et al.* 2004; Kiptot *et al.* 2007:515). As the groups tried to make sense of their situation, they bridged existing gaps, but as they moved across time and space that entailed another step of gap bridging (Dervin 2005b:27). Although ATIRI was not cited in the present study, this unit provided the formal linkage structure between KARI and other research organisations with extension and farmers' groups to disseminate innovative technologies and knowledge to farmers (Davis, K. E. 2006; KARI 2007) (see **section 2.2.4.1**). Davis (2004:82) observed that adoption rates of technologies were higher in geographical areas where ATIRI was active. This finding suggests a need to scale up the activities of ATIRI and to match their activities with sufficient resources as a strategy for bridge gapping by farmers. In addition, this finding suggests a need to encourage farmers not belonging to a group to



form groups in order to access services, and the need to devise other strategies that target farmers who do not belong to a group to ensure their information needs were met.

#### **10.3.3.3.4 The impact of decisions made by farmers' groups and individual farmers**

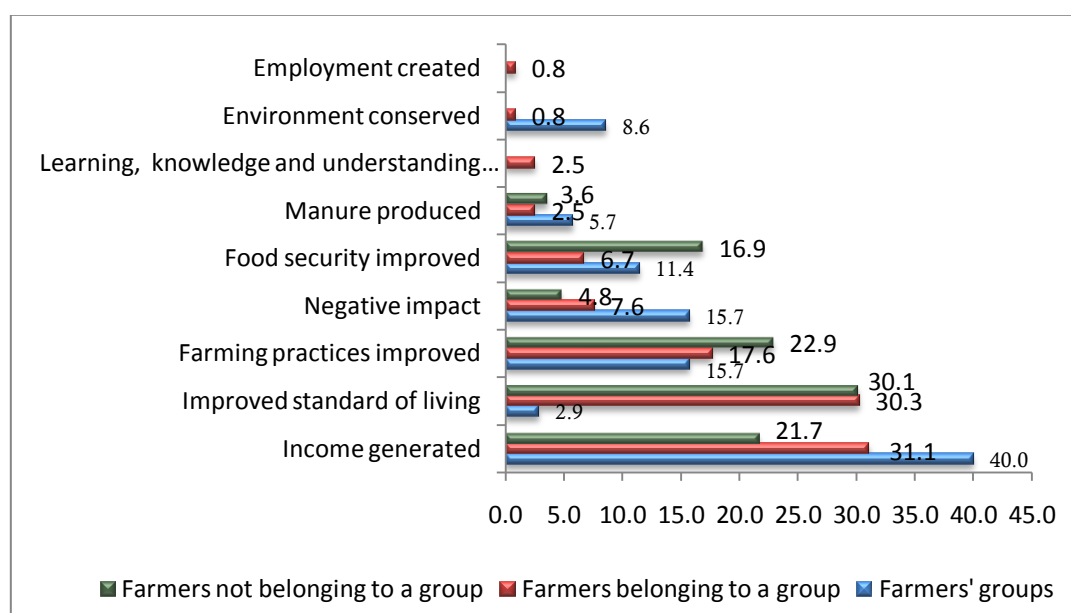
Farmers were asked to state how decisions they had made about agricultural enterprises had impacted on their lives in relation to farming. Findings from farmers' groups (N=79, 90 responses) showed that the decisions of the groups had increased income and profits (28, 40%), improved farming practices (11, 15.7%), improved food security (8, 11.4%), improved soil fertility and conservation of the environment (6, 8.6%), production of manure (4, 5.7%) and improved standards of living (2, 2.9%) (see **Figure 58** below). However, some groups attained negative impacts (11, 15.7%) such as lack of market, low yields and profits. Examples of narrations of some of the impacts of the decisions made by farmers' groups are presented in **Appendix 160**.

Farmers belonging to a group (N=93, 119 responses) perceived that the decision on the enterprise decided upon led to increased income (37 responses, 31.1%), realised improved standards of living (36, 30.3%), and increased adoption of technologies and improved farming practices (21, 17.6%). Others perceived that they had attained improved food security (8, 6.7%), had access to manures, and had learned and improved their knowledge, information and understanding (3, 2.5% each). A few stated that employment had been created and the environment had been conserved (see **Figure 58**). It was observed that the 9 responses (7.6%) that reported negative impacts were all in relation to poor markets and prices and high costs of inputs. For example, one informant stated "I regret planting tea and coffee and wished I had opted for other enterprises that earned good money," while another said "the fluctuation in markets and prices have made me keep moving from one enterprise to another." **Appendix 161** presents narrations of farmers belonging to a group on the impacts of the decisions they took on farming.

The key impacts of the decisions on enterprise on small-scale farmers not belonging to a group (N=64, 83 responses) corroborated those of farmers belonging to a group (see **Figure 58**). Four responses (4.8%) reported negative impact. One farmer stated, "I was unhappy and disappointed with the decision - the cost of farm inputs was high and there was poor rainfall." Others said, "Farming has not changed my life much as I still have to buy food from the market," and "I thought that the enterprises would generate sufficient income after retirement but the impact has not been positive." **Appendix 162** presents examples on the impact of decisions made by farmers not belonging to a group on farming.

Farmers shared similar responses for outcomes and impacts of decisions made on the choice of enterprise(s) on farming (see **Figure 57** and **Figure 58**). A comparison of the different categories of farmers on impact showed that there were more farmers' groups than farmers belonging to a group

and farmers not belonging to a group who perceived increased income or profit (40%, 31.1% versus 21.7% respectively). However, there were more farmers not belonging to a group who cited improved food security than farmers' groups and farmers belonging to a group. Farmers' groups experienced more negative impact, than farmers belonging to a group and farmers not belonging to a group. Additional impacts of decisions made on farmers belonging to a group included learning increased, knowledge and understanding improved, employment created and environment conserved. It was noted that farmers not belonging to a group did not cite improvement of soil fertility and conservation of the environment. This finding suggests the need for repackaging and promoting information on conservation of the environment to promote the practice of sustainable agriculture.



**Figure 58: The impact of decisions made by small-scale farmers on farming**

N=70 for farmers' groups, N=93 for farmers belonging to a group, N= 64 for farmers not belonging to a group

Impact was another element of the outcomes component of the Sense-making metaphor (Dervin 1998:41; Naumer, Fischer and Dervin 2008). As was the case of outcomes, there were differences between the three categories of farmers on the impact of the decisions they made on the choice of enterprise on farming (see **Figure 58**). The findings showed that the impact of the decisions taken by groups and farmers were related. While the decision taken by farmers' groups had a positive economic impact (income generation), the main impact for individual farmers was on improved standards of living. The findings also revealed that the negative impacts were highest within farmers' groups, followed by farmers belonging to a group then farmers not belonging to a group, perhaps suggesting that groups had an influence on improved agricultural productivity. As discussed ahead in **section 10.3.6** and **10.5**, the reason for this variation was possibly that groups were risk takers in the

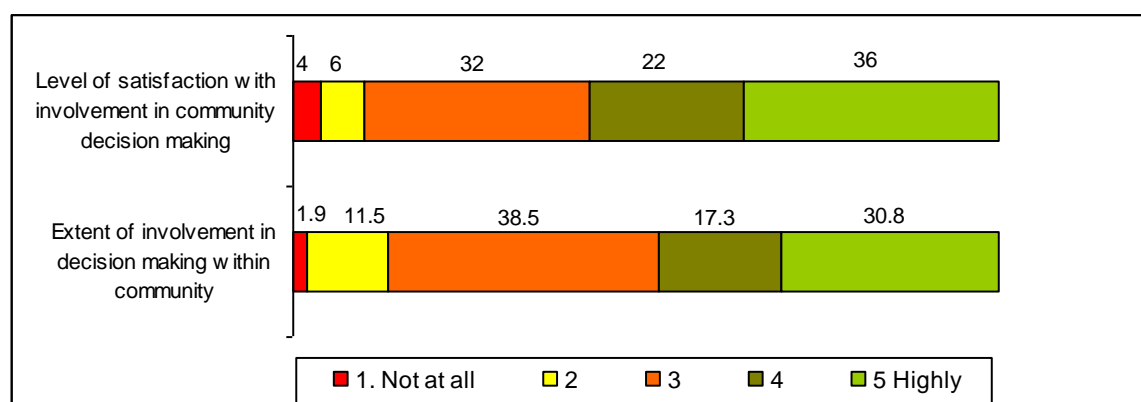


sense that they were more likely to try out new enterprises and farming practices. Groups also produced large quantities for sell. On the other hand, individual farmers were risk averse and preferred to work with what they knew or were convinced worked well, or tried out small quantities. Consequently, when the enterprise failed or there was no market or good prices, the effects were more adverse on groups than on individual farmers.

#### 10.3.4 Involvement of farmers' groups in decision making with the community

Apart from the outcomes and impact of decisions made on enterprises on farming, farmers also made decisions that affected the larger community. Farmers' groups were asked whether their groups were involved in decision making within their communities. Of 88 groups that responded, 53 (60.2%) answered yes while 35 (39.8%) answered no. Informants who answered yes indicated that some groups were invited to local institutions (schools, churches, training centres and other groups) (16 groups, 34%), group officials were co-opted or elected to lead development initiatives and projects in the community (9, 19.1%), some were invited to attend meetings, address barazas, and join committees within the community (8, 17%) (N=47), train and share knowledge and information with different target groups (7, 14.9%), be involved in other community projects and initiatives (5, 10.6%) and social activities in the community (2, 4.3%).

Farmers' groups (N=52) perceived their involvement in decision making within their communities to be at varying levels. On a Likert scale of one to five, 16 groups (30.8%) perceived that they were heavily involved, 20 (38.5%) were moderately involved and 1 (1.9%) was not involved at all. The findings indicated that 51.9% of the groups considered their involvement to be between average and not involved at all (see **Figure 59**).



**Figure 59: Perceptions of farmers' groups on the extent of involvement and level of satisfaction with involvement of groups in decision making**

N= 52 farmers' groups for involvement in decision making, N=50 farmers' groups for satisfaction with level of involvement

Farmers' groups (N=50) expressed varying levels of satisfaction with their involvement in decision making in the community. Eighteen groups (18, 36%) indicated that they were highly satisfied, 16 (32%) were moderately satisfied and a small minority of 2 groups (4%) were not satisfied at all (see **Figure 59**). It was noted that 42% of the groups indicated a satisfaction level of between average satisfaction and not satisfied at all, suggesting the need to identify ways of involving farmers' groups more in decision making activities in the community.

Dervin's Sense-Making methodology and sense-making theory provided a perspective for examining the information behaviour of farmers and their decision making processes. The theory helped to establish and explain what farmers "really think, feel, want and dream" (Dervin 1998:39; Foreman-Wernet and Dervin 2006:289) regarding their involvement in community development. The findings showed that group members, especially group leaders were involved in decision making levels in various community activities. Rausch (1996:35) observed that involving other people to participate in decision making improved the quality of decisions made because the decisions made drew from the specialised expertise and views of different people. Rausch (1996) advocated for appropriate participation, which entailed choosing the right people (people with unique knowledge, information, experience or in power and influential positions) to participate in decision making and involving them adequately "not too much, not too little ... [and] at the right time." In their survey of Landcare groups in Australia, Curtis and Cooke (2006:16) established that the groups engaged other community members and visitors to help them address issues pertaining to the management of land and water. The Landcare groups engaged in community activities such as production of a newsletter, writing of articles and letters in newspapers, participation in local authority meetings, involvement in school activities, field days, demonstrations and public displays and receiving visitors. In addition, involving farmers in decision making was important because their participation enabled them to use local knowledge such as in water management (The World Bank 2010a:18). These finding suggested a need to engage farmers' group leaders or selected members to participate in broader community issues in areas where they could contribute to community development and extend the goodwill of their groups to others.

### **10.3.5 Processes in problem solving / decision making / innovation**

This section presents results and interprets findings to the **research questions 4.3: *Can farmers relate specific instances when a major decision or innovation was made, understanding gained or problem solved as a result of using knowledge or information?*** and **4.4: *What knowledge and information helped make the decision(s) or solve the problem or innovate?*** Farmers' groups and individual farmers were asked to

describe a specific instance when the group made a major decision or innovation, solved a problem, or helped understanding as a result of using some item of agricultural knowledge and information.

#### **10.3.5.1 Examples of specific instances and knowledge and information that helped make the decision(s) or solve the problem, or innovation, or improve understanding**

Some examples of specific instances are given below, while **Appendix 163** presents examples of instances when farmers solved a problem, made decisions, innovated or improved understanding. Different types of information and knowledge from varied sources were used to inform the decision(s), or to solve the problem, or innovation, or to improve understanding as depicted in **Appendix 164**. In some cases, a group of actors collaborated with farmers, such as the case of the nine-seeded technology to arrive at a practical solution (see **section 8.8.3**). The Soft systems approach provided a lens for looking at interactions between actors (Röling and Jiggins 1998:304).

##### *Problem solving*

- i) Farmers decided to keep the dairy goat enterprise to solve the problem of household milk shortage. Their decision was informed by information obtained from the DGAK, which provided technical, operational, market and strategic information to farmers. DGAK trained farmers on dairy goat breeds, husbandry and informed them that the dairy goat produced high milk yields. They also learned that the milk was in high demand because it had medicinal properties and fetched good prices.
- ii) A farmers' group in Kamunyange explained that they decided to solve the problem of firewood, climate change and conservation of the environment. The group obtained training from a forest officer who guided them on tree nursery establishment and were earning income from sale of seedlings. Group members and some neighbours were given free seedlings to plant to conserve the environment and to provide fuelwood for their households.
- iii) One group wanted to generate income as a group and sat together to deliberate on what to do. They did not want an enterprise that would take too much of their time but wanted it to be profitable. They shared many ideas in their group meeting and a retired livestock officer advised them to keep pigs. They solved their problem by establishing a piggery as a group and participated in the group activities. Each member owned 10 pigs.

##### *Decision making*

- i) One group narrated: "Following a government call to form groups to access services and learn together, we decided to form a group and start bee keeping, to generate income. We sought help from the Ministry of Agriculture (extension) and were referred to the Ngong Agricultural Training Centre, where we were trained on bee keeping and how to make hives. We are now practicing bee keeping and are selling honey and bee hives to generate income."

- ii) “Our group decided to engage in a profitable and successful enterprise but we were not sure what to produce. After attending some NALEP trainings, we decided to adopt rabbit farming, and obtained training from the Ministry of Agriculture (extension), then bought a good breed male rabbit to service four female rabbits.”
- iii) Another farmers’ group that was operating as a “merry-go-round” decided to start bee farming after obtaining local knowledge from an elder and external technical and tactical information from the livestock extension officer about bee keeping and profitability of the enterprise. The farmers then decided to adopt bee keeping because the enterprise did not require much time or investment and offered promising returns.

#### *Improve understanding*

- i) Several cotton groups in Mwea decided on the growing of cotton after getting technical information from researchers on an improved cotton variety that was drought resistant, and operational, technical and market information from extension officers on where to get seeds to plant, how to manage the crop and where to sell.
- ii) One poultry group narrated how they were keeping chickens but they did not understand why they did not lay eggs even after feeding them for a long time. After consulting the livestock extension officer, he informed them that the hens could not lay eggs because they were too fat (the wrong breed for layers). They obtained technical and operational information on what chicks to buy and how to feed them.
- iii) One farmer narrated, “I was listening to the radio and heard about TCB and how they are high yielding and disease resistant and where to get seedlings. My group then visited JKUAT where we were trained and bought seedlings.”

#### *Innovation*

- i) Some coffee farmers had problems of pests and obtained technical and operational information from neighbours who were using exhausted oil on coffee stems. They demonstrated how to apply the oil and after learning that the oil prevented pests from climbing the tree, they applied the knowledge to their coffee.
- ii) One farmers’ group obtained local knowledge from elders in the community who were using Stinging nettle to control pests. The elders explained that Stinging nettle had pesticidal effects and demonstrated how they did it. The farmers then prepared their own foliar feed, which they applied to coffee.

- iii) One group addressed the problem of efficacy of pesticides during the wet season: “We decided to add a sticker<sup>81</sup> to pesticides to make them more effective during the rainy period.”

The study findings showed that farmers used different types of information and knowledge for problem solving, decision making, innovation, or understanding. Some farmers used external information, others used local knowledge, while others combined the two knowledge systems to solve problems or inform the decision, innovation or understanding. As pointed out by Llewellyn (2007:149), each type of information used had its own economic value. Farmers often adapted what they learned to suit their own circumstances and improvised, based on what they could get or afford. As pointed out by Bringe (2008:14) technology development and adaptation formed part of the innovation continuum. A key factor taken into consideration in decision making was the prior understanding or mental reference models of farmers, who preferred to think or make decisions in simple, convenient and natural ways (Wiig 2004:65). Farmers integrated external information from varied sources with their own experiences (Wilson *et al.* 2009:763), to evaluate alternatives and choose the best alternative (Rausch 1996). The study findings showed that information, knowledge and learning underpinned the decision making, problem solving and innovation processes, and enhanced farmers’ understanding of many agricultural aspects.

The examples outlined above of farmers using exhausted oil or adding a sticker to agrochemicals when it was raining are examples of farmer innovations. As detailed in **sections 4.1.7 and 4.7.4.3**, innovation is a product of networks that interact and yield new solutions to addressing social or economic dynamics (Salomon and Engel 1997a; Berdegúe 2005:3-4). Kamau’s (2007:154,155) study on researching with farmers showed that farmers in Mwea division obtained information from their group and other farmers on rice fodder and were feeding their milking cows with rice ratoons and rice plants that were not high yielding to increase milk production. The finding on farmers using cow urine for treating animals (see **Appendix 163**) was supported by Dinucci and Fre (2003:22-23), who found that pastoralists in Eritrea were treating cattle using a mixture of cow urine, salt and red soap. Mihale *et al.* (2009:254) also established that subsistence farmers around Lake Victoria in Tanzania were using cow urine to control field pests. Some were innovatively combining cow urine, detergent soap and neem leaves to control field pests. These findings showed that farmers’ groups as well as some individual farmers were active actors in the innovation process, and were, in their ways involved in agricultural research and extension. As pointed out by Nieuwenhuis (2004), the process of innovation was complex and was based on learning and trial and error.

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<sup>81</sup> Pesticides sprayed on plants are often washed off from the surface of leaves when it rains, thus lowering their effectiveness. The innovation by farmers to add a sticker made the pesticide stick to the leaves, thus allowing them to act on the pests.

The findings on farmer innovation underscored the role of the external and local knowledge systems in farming. The innovation on the nine-seeded technology by a team of stakeholders and farmers confirmed Rölíng's (2004:8) assertion that innovation is "the emergent property from the interaction of multiple stakeholders who consider themselves as an AKIS and who play complementary roles with respect to realising the innovative potential of a situation." The examples of innovation in Kirinyaga district confirmed other authors (Adenso-Okyeré, Davis and Aredo 2008:1), who pointed out that there were many different sources of agricultural innovation including researchers, farmers, CSOs and the private sector. However, as pointed out by The World Bank (2009a:258), there were many more important actors down the value chain whose role in innovation could be accounted for by the AIS framework. These findings suggest a need for further research in agricultural innovation systems to shed more light on the innovation and learning processes.

#### **10.3.5.2 Satisfaction with the decision / innovation / problem solved /understanding made**

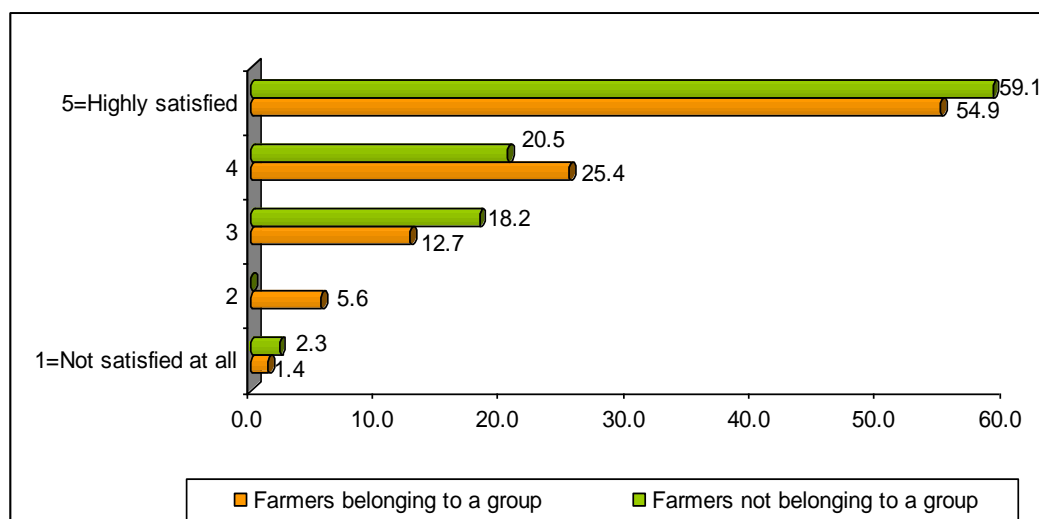
This section presents and interprets findings based on the **research question 4.4: *Were farmers satisfied with the decision(s) / innovation / solution? If so/not why?*** Farmers' groups (N=54), farmers belonging to a group (N=77) and farmers not belonging to a group (N=46) were asked whether they were satisfied with the decision / innovation / problem solved / understanding they made. Most (46, 85.2%) of the farmers' groups were satisfied while a few (8, 14.8%) were not satisfied. Likewise, the majority of individual farmers belonging to a group (73, 94.8%) and farmers not belonging to a group (45, 97.8%) were satisfied. The farmers' groups that were satisfied explained that they obtained the information or advice they sought and realised increased yields, income and improved livelihoods. Some groups stated that they produced enough food for household needs, while others had ventured into commercial farming such as sweet potatoes and horticultural produce for export. One group was making money by servicing the neighbours (non-group members) goats at a fee of KSh. 100 (1.33 USD) per service. Others said that the enterprises they adopted were doing well. One group remarked, "We have produced more than 300 litres of banana wine." Another said "We are selling rabbits at a cost of KSh. 600 (8 USD)." Still another commented, "We have produced many seedlings that have been sold, and planted many trees." Most of the dairy goat groups were satisfied and one group stated "We have seen the benefits of dairy goat milk on our sick children and we are about to start selling kids." The group that bought the wrong breed of chicks remarked, "Despite being misled, we later obtained the correct information and sold the fat chickens that were not laying eggs, and then we bought layers."

For some groups, the problems of pests and diseases, dying of fingerlings, or markets, group conflicts, and money were solved. Some noted that they were satisfied because their knowledge and understanding had improved. One group stated, "We learned about the profitability of dairy goats and understood issues of dairy goat farming such as housing, feeding, and disease control." Some

were happy because they were legally registered as a group and membership had many benefits (see **section 6.2.3**).

Some groups that were not satisfied with the decision, innovation, the problem solved or understanding. Some explained that it was because the crop performance was poor due to rain failure, while others said that they produced but did not find markets for their produce. Some explained that the Ministry of Agriculture staff who dug the soil conservation terraces were few hence many farmers did not benefit. The cotton groups expressed disappointment and explained that they expected higher yields but instead obtained low yields and were expected to service the loan that was advanced to them in kind (seed money paid to the ginnery and chemical spraying company (Juanco)) by Equity Bank. One group member remarked “We were producing cotton and Juanco was paid KSh.4000 (53.33 USD) for spraying each farm but we have not received any feedback or records from Juanco regarding how many times they sprayed each farm and the acreage sprayed.” The rice farmers pointed out that they experienced great losses from rice blast.

More than half the farmers belonging to a group (N=71) (39, 54.9%) and (26, 59.1%) farmers not belonging to a group (N=46) were highly satisfied, nine (9, 12.7%) of the farmers belonging to a group and 8 (18.2%) farmers not belonging to a group were neither highly satisfied nor not satisfied at all and only 1 (1.4%) individual farmer each among the farmers belonging to a group and farmers not belonging to a group were not satisfied at all (see **Figure 60**).



**Figure 60: The extent of satisfaction with the knowledge and information used to facilitate decision making / problem solving / innovation / understanding**

N=71 for farmers belonging to a group, N=46 for farmers not belonging to a group

### **10.3.5.3 Difficulties encountered in arriving at the decision / innovation / solution / understanding**

Most of the individual farmers (52, 72.2% belonging to a group (N=72) and 31, 72.1% not belonging to a group (N=43)) did not have major difficulties arriving at the decision / innovation / solution. However 20 (27.8% farmers belonging to a group) and 12 (27.9% farmers not belonging to a group) encountered difficulties pertaining to financial resources. More specifically, some members could not raise the money required to establish the enterprise they had decided on. In addition, there were problems of non availability of information or not knowing where to find the information required, confusion or uncertainty about what to produce, disagreements among group members or household units on what to produce and marketing challenges due to exploitation by intermediaries (see **Appendix 165**).

### **10.3.6 Processes involved in group versus individual decision making**

This section presents and interprets findings on the **research questions 4.6: *What processes are involved in group decision making?* and 4.7: *How does individual farmer decision making differ from group decision making?*** Decision making in most groups (N=90) was done by all group members (82 groups, 91.1%). However, in a few groups, decisions were made by the executive committee (6 groups, 6.6%) or by the chairperson (2 groups, 2.2%). The decisions made by groups (N=89) were shared with other members at group meetings (77 groups, 86.5%). In some cases decisions were shared through word of mouth by officials (door-to-door) (6 groups, 6.7%), through minutes and letters to members (2, 2.2% each), or notice boards and other members who attended the meetings (1, 1.1% each).

Farmers belonging to a group were asked to state how individual decision making / innovation / problem solving / understanding processes differed from that done by a group. Informants explained that individual decision making was easier and faster because it was based on what one person (household head) or the entire household knew, thought, preferred, their circumstances or capability. On the other hand, group decision making took a long time, called for several meetings and debates and required consensus of members. Some members perceived group decision making to be richer and wider as it was based on collective knowledge and information assets and resources of members. Others considered group decision making to be more reliable and less risky than individual decision making and argued that group decisions were based on well evaluated options.

Individual decision making was perceived to be more flexible and focused on personal or household interests (including spouse and children), while group decision making was more rigid and was guided by the group's objectives and collective interests of the majority of members. Some farmers argued that there were higher chances of failure in individual decision making than in group decision making. Others said that there were no conflicts with individual decision making whereas there were



opposing views and conflicts in group decision making. In some cases, the arguments were so severe that rebel members were expelled from the group to enable the group to forge ahead. The arguments on the differences between group and individual decision making are presented in tabular form in **Appendix 166**.

Fifty five (55, 60.4%) of the farmers belonging to a group (N=91) preferred group decision making, while 36 (39.6%) preferred individual decision making. Reasons for the preferences for individual decision making included: individual decision making was perceived to be simpler, faster and more flexible as it only involved the farmer and his / her household. There were no arguments or external forces hence it was not stressful or forceful as it was based on one's capability. Farmers who preferred group decision making perceived it to be richer, more exhaustive, well researched and analysed, and although it took longer, it was more grounded on facts and was more reliable. According to the informants, group decision making enlightened and empowered the slow and fast thinkers and since the decision was owned by the group, no one was blamed for the outcome(s). Group decision making addressed a shared objective supported by all members and helped members to learn what others knew. Others said that group decision making ensured unity and cohesiveness of the group and believed "*umoja ni nguvu*" (Kiswahili for unity is strength) (see **Appendix 167**).

The Cynefin framework, which has its roots in the phenomenological framework and is based on the Sense-Making methodology (Snowden 2002:102; 2005a; Kurtz and Snowden 2003:462-467; Mark and Snowden 2006; Snowden and Boone 2007) (see **section 5.1.5**), and the Complexity theory (see **section 3.2.4.4**), guided understanding and interpretation of some of the complexities in group decision making processes. As earlier noted by Dervin (1999:730), Sense-Making falls between "chaos and order." The study findings showed that individual decision making differed from group decision making. Like the present study, Shibanda (1999) observed that farmers took time before arriving at a decision, and the decision taken was based on expected outcomes and constraints. Individual decision making was often carried out by the household head who was often the male farmer, or female farmer in single parent households, divorced or widowed households, or collectively as a family (Solano *et al.* 2001:188). As established by other authors (Eckert and Bell 2005; Hammond and Chapman 2008:69), decision making was influenced more by the needs of the household and their values, beliefs and experiences. Although Solano *et al.* (2001:190) established that the most frequent decision making approach was that of one individual making the decision, the findings of the present study showed that most farmers belonging to a group preferred group decision making. This finding suggests that farmers' group members decision making relies on the opinions of more knowledgeable persons in their groups.

The present study, as did that by Davis (2004:156) showed that all group members participated in group decision making. According to Rausch (2001:1), the participation of all members in decision making helped to clarify issues and “meet everyone’s expectations and the needs of all.” However, group decision making was perceived to be complex and took several meetings to arrive at a decision because the groups had to vote to obtain the required consensus of members. There were challenges in groups, with members having different interests, views and commitments, which sometimes led to conflicts (see **Appendix 166**). This finding was consistent with that by Barkhi *et al.* (1998:206), who established that groups encountered complex issues that were open to several interpretations because of the different objectives of individual members. The complexity aspect is partially explained by The Cynefin framework, which factors in people’s experience and the different environmental factors to understand complex phenomena. This framework helped to explain how leaders assessed complex situations in a group and intervene through sense making, depending on the specific context or situation (Kurtz and Snowden 2003:468-470; Snowden 2005a; Snowden and Boone 2007:70-74). The peaceful periods when groups shared and exchanged ideas and agreed on an amicable decision were explained by the ordered ontology of the Cynefin framework. Under this domain, group members adhered to best practices and hardly disagreed.

Where farmers had to make complicated decisions (complicated domain), the group members sourced multiple possible options which they debated on and tried to make sense of and find answers to the multiple questions they had before arriving at an appropriate decision. For example when group members made decisions on what enterprise(s) to produce, they had many questions and had to seek information or seek advice from an expert. This phenomenon was explained by the complex ontology (Snowden and Boone 2007:71,74), which necessitated the involvement of experts and more fact finding to make sense of the diverse views before arriving at consensus. On occasions, groups faced challenges of disagreements, opposing ideas and conflicts during decision making. This phenomenon was partially explained by the chaotic domain (Kurtz and Snowden 2003:469; Snowden 2005a:50,52). The conflicts experienced entailed acting with speed and taking drastic action such as expulsion of members to stabilise the turbulence and reduce confusion. The drastic action transformed the situation from chaotic to complexity and allowed people to “think outside the box.” As pointed out by Snowden and Stanbridge (2004:146), humans had learned how to improve between order and unordered. The study findings showed that although some groups appeared to work together, there was ambiguity about information shared and some groups and members did not have the same knowledge, leading to information asymmetries (see **section 7.3.4**).

### **10.3.7 Suggestions for improving decision making**

Farmers made several suggestions on how to improve decision making (group and individual). In terms of information provision, farmers suggested the need to increase the number of training

opportunities, demonstrations, seminars, study tours. Farmers also suggested the need to provide appropriate and comprehensive agricultural information and knowledge at the local level, and to increase the number of information providers. More specifically on farmers' groups, farmers suggested the need to strengthen the capacity of groups, to provide training on leadership and organisational development, improve communication and to establish a clear vision, goal and objectives. Others suggested the need to encourage individual farmers to join groups, inculcate trust among group members and improve participation by all group members. On improving decisions on marketing, farmers suggested the need to improve linkages and to reduce the marketing chain linkages. Additional suggestions on improving problem solving, decision making, innovation and understanding are presented in **Appendix 168**. **Appendix 169** presents suggestions on how to improve individual and group decision making.

In addition to the above suggestions on how to improve decision making, Backus, Eidman and Dijkhuizen (1997:307,323) suggested the need for i) systematic working and regular monitoring of operations to be able to perceive areas for adjustment; ii) proper assessment of the prevailing situation to avoid acting in haste; iii) arriving at many alternatives; iv) discernment of emerging opportunities; and v) analysing the estimated returns on investment against alternative plans and vi) using decision support systems. Davenport and Prusak (2000:170) underscored the importance of knowledge in enabling people to make improved decisions and the subsequent actioning. The study findings showed that information and knowledge were pivotal in improving group and individual decision making, and confirmed results obtained by earlier authors (Kaniki 1989:6,84; Duveskog, Mburu and Critchley 2002; Awad and Ghaziri 2004:36; Nyumba 2006), who established that information and knowledge (external and local) were crucial for sound decision making (see **section 4.7.4**). These findings suggest a need to increase the number of information providers, provide information and knowledge resources, increase training opportunities for farmers' groups, individual farmers and group leaders.

The findings of the present study showed that farmers' groups needed training on organisational development and needed to have a shared vision, goal and objectives, improving participation and inculcating trust among members. The finding on improved participation was supported by Rauch (1996), who also emphasised the need for simple rules or guidelines such as whom to involve, at what level to involve them, when to involve them and at what intensity. Decision making in groups could also be improved by building the levels of trust between group members. Zand's (1972:231-237) study on trust and problem solving showed that trust improved the effectiveness of problem solving and that elements of mistrust contributed to misunderstandings. According to Zand (1972), trust also increased the propensity to share "relevant, comprehensive, accurate, and timely information," which influenced how members related to each other and facilitated smooth problem solving.

#### 10.4 Sufficiency of knowledge and information and knowledge in the AKIS

This section provides and interprets findings that responded to the **research question 4.8: *Is the knowledge and information available in the AKIS sufficient for addressing the needs of farmers? If not, how do farmers go about seeking external information?*** Farmers were asked whether the knowledge and information generated and shared by key actors in the district was sufficient for addressing their needs. Fifty (50, 54.3%) farmers belonging to a group (N=92) and 40 (66.7%) farmers not belonging to a group (N=60) answered no. Individual farmers belonging and not belonging to a group expressed various needs and wants for agricultural information (see **Appendix 170**).

Different people, institutions and technology within the AKIS framework possess knowledge embodied in their practices and activities (Anderson 1999:333). To be of use, this knowledge and information needs to be shared by establishing linkages with relevant actors in the AKIS to improve the flow of information. The finding on more than half the farmers in Kirinyaga district not having sufficient agricultural information and knowledge for their farming needs demonstrate a mis-fit between national plans and the agricultural sector development achievements. This finding concurred with Stilwell's (2008:156) conclusion in her paper on "Mapping the fit: library and information services and the national transformation agenda in South Africa," which pointed out that although much had been accomplished in terms of information policy, information resources, systems and services, much more remained to be done in terms of policy, information resources and services for development. The GoK had done much and had developed a draft information policy, and various actors had played an important role in facilitating the flow of agricultural information and knowledge to farmers in rural communities but a wide gap remained. As asserted by Ferreira and Neto (2005:6) and Awad and Ghaziri (2004), knowledge and information needed to be shared. The study finding on the inadequacy of information and knowledge pointed to gaps in the AKIS and suggests a need to strengthen and increase linkages between actors and improve access to up-to-date and comprehensive information and knowledge.

#### 10.5 Barriers and constraints in accessing and sharing agricultural information and knowledge and suggestions for overcoming them

Linked to the needs and wants of agricultural information and knowledge were problems or constraints encountered by small-scale farmers in accessing and sharing external and local agricultural knowledge and information. This section addressed the **research question 4.9: *What problems / constraints do small-scale farmers / groups face in accessing agricultural knowledge and information?*** This section presents findings on the barriers and constraints that small-scale farmers encountered and suggests ways of overcoming them.

### **10.5.1 Barriers or constraints encountered by small-scale farmers in accessing and sharing external agricultural information and knowledge in general**

Farmers' groups and individual farmers encountered similar barriers and constraints in accessing and sharing agricultural information and knowledge (see **Appendix 171**). The main barriers and constraints encountered included:

- Limited availability of information providers. Informants expressed concern that most information providers did not visit individual farmers and were difficult to find in their offices.
- Poor access to quality information on production, value addition, markets and prices. In some cases, information was not received when it was needed, while some information providers lacked proper understanding of the agricultural subject matter. As a result, they could not provide good explanations to farmers or they shared inaccurate and misleading information. Some indicated that the information received was not sufficient.
- High cost of information services such as veterinary services and training. Inadequate information resources and limited learning opportunities such as training, seminars and field days.
- High interest rates on agricultural loans and credit.
- Poor awareness of what information was available and where they could find the information or knowledge.
- Personal, social and cultural barriers such as ignorance among some farmers, apathy, mistrust, jealousies, innate reluctance to share information and knowledge, lateness and absenteeism at meetings, training or group activities.
- Communication barriers such as the technical language used on labels, information resources and by some information providers, distance barriers, poor telecommunication infrastructure, and arguments among group members.
- Some farmers could not read and write hence relied on oral communication sources.
- Poor coordination and cooperation between actors due to inappropriate policies that formalise collaboration.
- Actors sharing conflicting information because they had different objectives. This phenomenon was observed by farmers when buying inputs from stockists, where each vendor provided the information that would sell the products in stock and not necessarily, because they were the best option.
- Doubt and mistrust of information leading to unwillingness to share.
- Inadequate financial resources to support and facilitate information sharing activities.
- Poor ICT infrastructure to facilitate communication between actors (see **Appendix 172**). The barriers and constraints encountered led to low yields and profits. Some farmers indicated that they had lost money and time invested in enterprises that did not have good markets and prices.

### **10.5.2 Overcoming barriers and constraints encountered by farmers in accessing and sharing external agricultural information in general**

**Appendix 173** presents various suggestions for overcoming the barriers or constraints in accessing and sharing information including:

- Increase the number of information providers working with farmers.
- Strengthen the capacity of service providers and improve linkages between actors. Establish more training institutions nearer to the farmers.
- Improve access to training and information by providing more opportunities for training, seminars, tours, regular barazas and field days and demonstrations. Avail farmers of market, price information to farmers, and establish local information centres that are equipped with relevant and appropriate content.
- Raise / increase awareness of existing sources of information.
- Improve communication (mobility and infrastructure) by providing FEOs with transport to visit farmers. Another suggestion was to reduce communication and telecommunication costs and improve the rural ICT infrastructure.
- Target information to meet the needs of farmers in terms of content, format, language and local conditions.
- Facilitate access to credit and funding.
- Subsidise the cost of agricultural inputs.
- Facilitate adult literacy classes.

### **10.5.3 Barriers or constraints encountered by small-scale farmers in accessing and sharing local knowledge**

The findings on barriers and constraints encountered by farmers' groups, individual farmers belonging and not belonging to a group are presented in **Appendix 174** to **Appendix 176**. The main barriers encountered included:

- There were very limited sources of local knowledge in the community.
- Most farmers did not know who had local knowledge.
- Most of the knowledge was not documented and was tacit, held in the heads of the elderly who were not easily accessible to community members. Some of the knowledgeable old people had died before their knowledge was captured, leading to attrition of knowledge. Some farmers noted that the little information that was written in notebooks was incomplete and not well captured hence did not work when tried out by others.
- There were personal, social and cultural barriers and some information providers were ignorant, rigid and reluctant to share their knowledge. Some did not trust the knowledge shared and looked down on it, while others had negative opinions of local knowledge.

- Some of the indigenous methods that were shared did not work, which demoralised farmers.
- Farmers did not know where to source local biological materials, which were scarce due to loss of biodiversity.
- Poor communication infrastructure making it difficult to reach farmers with indigenous knowledge.
- Arguments among group members regarding the value of local knowledge.

These barriers and constraints had occasioned the spread of pests and diseases and “stealing” of indigenous materials. In some cases, the quality and quantity of farm produce had been affected leading to low yields and profits.

#### **10.5.4 Overcoming barriers or constraints to accessing and sharing local knowledge**

Farmers’ groups and individual farmers suggested various ways of overcoming the barriers and constraints encountered in accessing and sharing local knowledge. **Appendix 173** presents some strategies employed to overcome some of the barriers and constraints. The main suggestions focused on:

- Discussing local knowledge issues at group meetings and barazas.
- Consulting local elders, rural experts and knowledgeable neighbours or community members.
- Visiting farms of farmers who are applying local knowledge or attending demonstrations, training and tours.
- Passing on information through stories from the older to the younger generation.
- Referring to documented sources of local knowledge.
- Consulting other farmers’ groups.
- Recording and documenting local knowledge.
- Communicating using local language to explain indigenous practices to community members that were not literate.
- Seeking advice from extension officers or input stockists.
- Carrying out trials to validate the efficacy of local practices before sharing the knowledge.
- Leaving people to decide on their own what they would like to adopt.

When asked what they would do if they had power, informants indicated that they would:

- *Improve cooperation / collaboration:* Start inter-actor collaboration at national level and trickle down to grassroots level; reduce bureaucracy (red-tape) in institutions; make actors plan together and chart out what farmers needed from each stakeholder; have joint stakeholder planning teams at district and division levels to improve linkages and address the needs of farmers as a team;



enhance networking with other actors; and handle research and extension activities in the field concurrently.

- *Capacity strengthening / building:* Train all stakeholders; hold regular meetings to monitor and evaluate progress; increase the number of extension officers; strengthen the capacity of HCDA; and strengthen farmers' groups to market produce of farmers; establish a horticultural association in the district and roll it out as a national institution to provide a platform for sharing and exchanging information and to improve marketing; streamline the marketing system to empower farmers to market their produce directly and reduce the marketing chain.
- *Curriculum and relevant content:* Redefine curricula in training and education institutions to address present needs of farmers; develop local content that meets the needs of farmers in their contexts and repackage content in simple "farmer language" and in appropriate formats and in local languages.
- *Infrastructure:* Improve the road network rural ICT infrastructure (electricity and telecommunication).
- *Sustainability:* Ensure all projects and programmes are channelled through the stakeholder forum for synergy and sustainability; and that AKIS actors work jointly towards meeting the needs of farmers as opposed to institutional interests.

**Section 4.7.5** discussed the barriers that farmers encountered in accessing and sharing agricultural information and knowledge. The barriers or constraints presented above were similar to those identified by other authors (Odini 1995) in Kenya, (Kiondo 1998:223-224) in Tanzania, (Iriwieri 2007:41) in Ethiopia, and (Byamugisha *et al.* 2008:98) in Uganda. It was observed that the barriers and constraints observed by Odini (1995) in Kenya were as true today as they were in 1995. The finding on poor awareness of where to find information or knowledge or knowledge of what information was available confirmed findings of earlier authors (Kimenye 1998:201,210; Franzel *et al.* 2004; Stefano *et al.* 2005b:64; 2009:51). These findings suggest a need to manage agricultural information and to create awareness of the available information.

Baker *et al.* (2001) reported the challenge of being dispersed in remote areas. Other barriers included failure to recognise and reward people for their contributions, and to provide platforms for interaction and sharing (socialisation) (Skyrme 1999), illiteracy (Mamodu 2002:409), insufficient and untimely market information (Renko, Nikolasevic and Pavicic 2002:544; Pokhrel and Thapa 2007:157), disintegration of groups, mistrust between farmers when sharing market information and distance and transport costs (Masakure and Henson 2005:1728), lack of appropriately packaged local content as a barrier to accessing agricultural information (Stefano *et al.* 2005b:61; Chilimo 2008:232), weak information systems, poor regulatory framework and inadequate market information (Kidane, Maetz



and Dardel 2006:xiv,55) and targeting information to meet the needs of farmers in terms of content, format, language and local conditions (Llewellyn 2007:155).

The challenges identified by the present study were similar to those established by Byamugisha *et al.* (2008:98) in the context of urban farmers in Uganda. In addition Byamugisha *et al.* (2008:98) found similar challenges to identified the lack of cooperation other farmers, high transport costs, lack of an information sharing culture and insufficient or lack of information on specific topics. Cook (2009:6,8) identified the barrier of lack of accurate information. The finding of the present study on inadequate market information points to the need to provide this crucial type of information to farmers to strengthen their capability and bargaining power and guard farmers against exploitation by intermediaries (Pokhrel and Thapa 2007:157). These findings suggest a need to repackage current, comprehensive and timely agricultural and market information in appropriate formats and languages and to disseminate the information to farmers regularly using their preferred communication channels. Apart from improving access to market, there is the need for improving the marketing chain and equipping farmers with appropriate and timely market and price information.

The finding of the present study on farmers not knowing who had local agricultural knowledge was corroborated by Nwokeabia (2006:1-2), who found that some farmers did not know whether their knowledge would be appreciated by others or not, hence fell into an “indifference-trap,” leading to asymmetric information. Nwokeabia (2006) confirmed the findings of the present study in relation to the low level of sharing of local innovations and discoveries because they were not recorded. Iriwieri (2007:41) distinguished the challenge of farmers being risk averse, which made them rely on traditional practices instead of taking the risk of experimenting with new technologies or innovations. Iriwieri (2007) affirmed the present study’s finding that the communication language used by extension officers (too technical) was a barrier to access.

With regard to limited availability of resource persons, the findings of the present study concurred with other authors in Tanzania (Kiondo 1998:185; Ngowi *et al.* 2007:1622) and Kenya (Rees *et al.* 2000:10). Ngowi *et al.* (2007:1622) found that vegetable farmers in Tanzania did not have adequate skills on safe use of pesticides because they did not have access to extension officers to train them. The staff shortage points to the need to increase the number of information providers in rural areas. The present study found that a key challenge that farmers faced was on the technical language used on labels, which most farmers could not comprehend. Ngowi *et al.* (2007) found that the labels did not provide instructions on how to mix more than two pesticides or ingredients that may react adversely and be of injurious to the health of farmers.

On the issue of doubt, mistrust and jealousy, Temu, Mwanje and Mogotsi (2003:3-4) found that the existing systems did not accord the indigenous people an opportunity to participate actively and doubted the credibility of the knowledge of farmers. Another element of mistrust was observed among the different actors working with farmers on the same initiative. Mubangizi, Mangheni and Garforth (2004:261) reported that some private service providers would not share information they had with others for reasons of power and wanting to be the only ones that had the information. Stefano *et al.* (2009:51) observed a similar phenomenon among external actors working with farmers, who tried to sabotage the efforts of other actors by conniving with volunteers working on a joint-initiative to deny farmers the information that they needed at a very critical stage. The reason was the particular component for which the farmers needed information on was supported by a different actor.

The finding of the present study on the barrier of insufficient information was similar to that of Tripp and Pal (2000:139), who found that seed companies in India did not provide sufficient information on varieties and most relied on brochures and limited demonstrations. The flow of information from producers to breeders or seed companies was also insufficient. Mubangizi, Mangheni and Garforth (2004:261) also found that the information available to farmers in Uganda was not adequate for their farming needs in terms of quality and quantity. The barrier of inadequate information could be explained by the Anomalous state-of-knowledge (ASK) concept (see **section 3.2.4.3**). Farmers experienced a gap or anomalous state of knowledge when they became aware that the knowledge and information they received was not sufficient to solve their problem or situation at that particular time. The gap then created another need to receive the missing information, which motivated them to seek information to accomplish what they wanted to do. As pointed out by Stilwell (2002:70) the ASK helped to explore incomplete information.

The barrier identified by the present study on poor access to knowledge and information was similar to that established by many authors (Kaniki 1989; Aina 1995; Rees *et al.* 2000; Stefano *et al.* 2005b; Braun *et al.* 2007:19; Chilimo 2008:260). This finding has policy implications for provision of comprehensive agricultural information and knowledge. On high cost of information for services, Stefano *et al.* (2009:51) found that most rural people could not access information because either they did not have the resources to access the information from external sources or they did not know where to find the information. Many farmers were thus reactive and waited for information to come their way. One informant in the Stefano *et al.* (2009:51) study in South Africa described this phenomenon by saying “Getting knowledge is a slow process, just like the coming out of the sun. It doesn’t just shine, it comes out slowly and slowly, and eventually we can all see it and it is warm.” Likewise, getting knowledge was an incremental process.

The barriers on high cost of information services and poor access to information have led to the exclusion of farmers from accessing agricultural information and knowledge, which they need to increase agricultural productivity. As noted by UK. Department of Social Security (1999:vii) “it is morally wrong to allow a whole generation to be written off.” While a few NGOs such as ALIN-EA and AfriAfya provided the necessary infrastructure and content to rural communities, these efforts were isolated and did not benefit the critical mass whose needs for agricultural information remained outstanding (Stilwell and Munyua 2009). This barrier, discussed in detail in **section 4.7.5**, further accentuated the barrier of social exclusion of rural communities, and suggests a need to develop policies and strategies than ensured inclusion of farmers in all aspects of information provision services as well as in rural planning and development in general to abate marginalisation of rural agricultural communities.

## **10.6 Summary**

Chapter ten examined the usage of agricultural information and knowledge, and focused on the types of knowledge and information used from major sources of information, the frequency of use and application, the decision making processes by farmers’ groups and individual households, processes in decision making, innovation, understanding and problem solving. Chapter nine further assessed the sufficiency of the knowledge and information in the AKIS for addressing the needs of farmers and the problems and constraints encountered in accessing and sharing agricultural information and knowledge.

The findings showed that most farmers used operational, technical, awareness and marketing information from the major sources. Although extension emerged as a key source in providing operational, technical and policy information, there was consensus in all the four divisions that they were weak in market and strategic information. While groups and farmers belonging to a group obtained information regularly, farmers not belonging to a group were more irregular. What emerged from the study on decision making was that there were differences between farmers’ groups and individual or household decision making. Individual decision making was perceived to be faster, more flexible and easier, while group decision making took longer, was more complex and called for consensus. Generally, farmers were not satisfied with the information and knowledge available in the AKIS and faced many barriers and constraints in accessing and sharing information and knowledge.

# CHAPTER ELEVEN: CURRENT PRACTICES IN MANAGING EXTERNAL AGRICULTURAL INFORMATION AND LOCAL KNOWLEDGE

## 11.0 Introduction

Apart from the ways suggested above for overcoming barriers and constraints in accessing and sharing agricultural information and knowledge, these obstacles could be overcome through proper management of external information and local knowledge. Chapter eleven presents and interprets findings on **research objective five: Determine the current practices in managing external agricultural information and local knowledge**, and answers the research questions under this objective. While **section 4.7.6** discussed some efforts made in agricultural information management and knowledge management, this Chapter focuses on how agricultural information was collected, processed and disseminated in Kirinyaga district, as well as how the information disseminated was used.

In addition, Chapter eleven outlines the current practices in capturing, recording and sharing local knowledge, usage of the knowledge recorded, as well as the reasons for managing information and knowledge. Data responding to the research questions under objective five was collected through focus group discussions with farmers' groups and through interviews with farmers, government ministries, training and education institutions, research institutions, NGOS, CBOs, religious organisations and projects, key informants and a questionnaire with information providers. Besides a study of AKIS in Eritrea, Garforth (2001c) found that constraints faced by farmers could not be solved without new knowledge and information. The need for knowledge and information thus led to consensus on the need for increased interest in social and managerial approaches to managing knowledge (Abdullah *et al.* 2006). The KIS perspective facilitated understanding of how farmers' groups collected, processed, shared and used external information and how they captured, recorded, shared, used local knowledge and created new knowledge (Salomon and Engel 1997a).

## 11.1 Managing external agricultural information

This section presents results and discusses findings on the **research question 5.1: *What systems are in use for managing agricultural information?*** Farmers' groups and other information providers including the Ministry of Agriculture and the Ministry of Livestock Development, training and education institutions, research institutions, NGOS, CBOs, religious organisations and projects were asked to describe specific instances when their groups or units collected, processed, stored and disseminated agricultural information.

### **11.1.1 Collecting external agricultural information**

Results showed that farmers collected external agricultural information from many information providers (extension, the private sector, research, training and education institutions, CSOs and input suppliers) orally and by observation, training sessions, exhibitions, shows, field days, barazas, demonstrations, research institutions and from representatives of agricultural inputs. Some information was gathered in the form of print materials such as books, periodicals, brochures, posters, handouts and booklets. Some groups and individual members received the monthly magazine *Organic Farmer* (see **Appendix 177**). Only one farmers' group collected print and electronic resources on pest management from their collaborators abroad. The "Information desk" of the Ministry of Agriculture collected print and electronic resources from various information providers (see **section 9.1.12**). Likewise, institutions such as KARI, MIAD and other research and training institutions such as KATC, divisional agricultural extension offices and NGOs collected print and electronic information resources including published materials such as books, journals and reports, other gifts and donations, and information and knowledge databases. Research, training and education institutions in Nairobi also collected external agricultural information through subscription to published materials such as journals, proceedings, books, reports, grey literature and online databases.

### **11.1.2 Processing and storing external agricultural information**

Most groups did not process the information that they collected from the various sources. One group indicated that they had a computer that was acquired through a pest management project, and information resources on pest identification and management provided to the group through the project were stored and retrieved using the computer. This group also used the computer to process and store information for the group. Information for the other groups was stored in the group's records book or minutes file, arranged chronologically by date. Print materials were stored in a file, which was kept by the secretary or the chairperson. With regard to oral information, groups wrote minutes that were stored by the group leaders, while individual farmers wrote personal notes. Most of the information that was captured in people's heads was stored in people's heads.

There were very few resource centres or libraries in Kirinyaga district. Information resources held at the "Information desk" at the Ministry of Agriculture's district headquarters in Kerugoya was not processed, but was stored in a cupboard by the officer in charge of the collection. The KATC had a resource centre with a small collection of agricultural related materials. One NGO informant pointed out that KENDAT had helped establish techno centres in some parts of Mwea division, which provided some information and advisory services to farmers. KENDAT plans to establish Millennium Information Centres that will be equipped with information resources and internet connectivity. A few other CSOs also had resource centres. The MIAD centre had a resource centre

that was equipped with some agricultural information resources, e-mail and internet access. Data gathered through interviews and focus group discussions with farmers' groups indicated that there were only five resource centres or libraries in the community, which stocked small collections of information on agriculture, horticulture, health and education but there was no bibliographic control. Information held by training and education and research institutions located in Nairobi but working with farmers in Kirinyaga district was processed using computers and international bibliographic processing standards and online and print catalogues were maintained to facilitate retrieval.

### **11.1.3 Dissemination of external agricultural information by farmers' groups**

Farmers' groups disseminated the external agricultural information that they collected, processed and stored orally through informal discussions, through group meetings and through training (when training other farmers). The group members had open access to the group's minutes or print materials, while some information was shared orally at barazas. Some farmers' groups shared their notes and personal collections of print materials or books that they bought with neighbours or other group members. With regard to media, only one group cited an incident when they shared information on their pest management project on TV. Another group indicated that they did not disseminate their information beyond the group members. This result corroborated those obtained in **sections 7.3.4**, many groups did not share the external information that they possessed beyond the group members. This culture of not sharing information denied other community members access to useful information that they could have applied to improve agricultural production and marketing. Other actors in the community such as NGOs, government departments, training and education and research institutions, agrochemical, seed and feed companies had elaborate information systems at their head offices. Most of their information was disseminated orally, through print materials such as brochures and posters, and through radio and TV (see **section 2.2.4**).

Resources at the "Information desk" in Kerugoya were open to farmers and other actors in the district. As outlined in **section 9.1.9**, the Ministry of Agriculture mounted the "Information desk" at major markets to disseminate the agricultural information that they collected and processed. Resources at the MIAD resource centre were open to farmers and other stakeholders that visited the centre or attended seminars and training. As noted earlier in **sections 9.1.12** and **9.5.1** the resource centre provided internet facilities for accessing and sharing information (especially youth groups). Although KARI headquarters and in particular the AIRC under the Ministry of Agriculture collected and repackaged farmer materials in print, video, audio and other electronic formats, these resources were stored in Nairobi and were not mentioned by any of the informants in the study sample. KARI for example offered several bibliographic services including current awareness and a question and answer service to various actors including farmers. Other organisations such as ICRAF, ILRI and ICIPE and other national, the private sector and CSOs repackaged materials and produced posters

and leaflets that were disseminated to various national institutions and collaborating partners and projects (see **section 2.2.4**).

#### **11.1.4 Reasons why farmers' groups managed information**

Farmers' groups (N=17) collected, processed, stored and disseminated agricultural information for various reasons including for future reference (5, 29.4%), to enlighten group members (4, 23.5%), other community members and to improve farming activities (2, 11.8% each). Other reasons included to reduce poverty, because the information was beneficial, to improve accessibility and usability and to facilitate records keeping and the maintenance of balance sheets.

#### **11.1.5 Usage of external agricultural information collected**

In addition to the external agricultural information that farmers' groups obtained from key sources (see **section 10.2**), some groups used resources collected, processed and stored by their group. Focus group discussions with farmers' groups (N=18) indicated that the information that was collected by the groups was: i) used to improve the enterprise(s) adopted by the group, and production and farming in general; ii) applied when training other groups and community members; iii) used to establish new enterprises such as French beans, TCB, mushrooms, bee farming and zero grazing; and iv) used for non farm activities such as the making "fireless cookers."

*Information management:* Information management is mainly geared to managing explicit knowledge and information (Bouthillier and Shearer 2002). Overall, the study findings indicate that the processes of information collection, processing, storage and dissemination in Kirinyaga district were traditional and basic, and there was little coordination in collecting, storing and dissemination of information activities. The findings were consistent with other authors (Zijp 1994; Aina 1995:5; Stilwell 2001b; Stefano 2004), who established that information for farmers was not packaged and disseminated. However, according to Powell's (2003:1-2) explanation (see definition of key terms in the preliminary pages), which emphasised the aspect of "working out what information is needed by the people with whom you work, where it might come from, and what they need it for," the findings of the present study showed that most farmers' groups and actors had competence in working out the information that members whom they served needed, knew the sources of information, and could use and reuse the information whenever needed, regardless of the storage medium, which was mostly in their heads, notes, minutes or records books and collections of other documents.

*Collection:* The study findings showed that there was little activity and coordination with regard to collecting external agricultural information in Kirinyaga district and the current processes were rudimentary and unsystematic. Most external information was scattered among various actors and was captured orally. Confirming the findings of the present study, Kiplang'at (1999:115) showed that



rural people in Kenya had been bypassed by the “acquisition, processing, storage and communication” of agricultural information and Maina (2000) and Rege (2006:216) endorsed this finding. This finding had implications for the information provider and suggests the need to employ librarians or information scientists in rural areas to collect, process and disseminate agricultural information to facilitate easy retrieval or to equip agricultural officers responsible for the collections with information management skills.

*Processing and storing:* The present study established that there was little processing and storing activities as most external information was captured orally and was stored in people’s heads. The few print materials collected were stored in files or boxes and no bibliographic processing was carried out. Meyer (2002:154) in South Africa also found that most of the new external knowledge introduced to farmers through training was captured and stored in people’s heads. Various authors have emphasised the need to process and add value to information (Zijp 1994; Scarr *et al.* 1999:573; Meyer 2000:209), to ensure it was suitable for the needs of farmers. Zijp (1994) asserted that appropriate packaging of agricultural information was essential to accelerating food production. As early as 1999, Scarr *et al.* (1999:573) pointed out that the development of suitable information packages for learning and training of farmers was a key activity in ensuring agricultural technologies developed were adopted by farmers. Other authors (Allen *et al.* 2001:217; Stilwell 2001b:55; Morris and Stilwell 2003:80) pointed out a number of ways of repackaging information for rural communities (see **section 4.7.6**). Although the AIRC, KARI, the Ministry of Agriculture libraries and documentation centres in Nairobi processed and stored external agricultural information using international standards for processing, their information did not reach small-scale farmers in Kirinyaga. However, the AIRC repackaged external information and produced radio programmes, which were aired in vernacular language, as well as in print and video materials.

*Dissemination:* The study findings showed that farmers’ groups disseminated the external agricultural information that they collected, processed and stored orally, while a few groups did not share their information beyond the group members. This finding partly supported those of earlier authors in New Zealand (Allen *et al.* 2001:217) and South Africa (Stefano *et al.* 2005b:64), who showed that most information was disseminated orally through interactions with different actors. Meyer (2002:154) found that groups in South Africa relied on the social capital of group members who reminded each other or provided clarification to each other whenever needed (see **section 6.3.1.7**). The findings of the present study were partially explained by the KIS perspective (Röling 1992; Engel 1997:31; Salomon and Engel 1997a:19), which takes an holistic view of the information and knowledge processes (generation, transformation, transfer consolidation, receipt, and fed back) (see **section 3.2.1.1.4**). In essence, all agricultural actors including farmers and farmers’ groups generated, transformed, transmitted, integrated, disseminated and used agricultural knowledge and



information. The present study thus confirms Allen *et al.*'s (2001:217) call for interactions and collaborative learning approaches between actors.

Mchombu (2004:40) pointed out that users saved time and resources accessing external information that had been managed, and that rural communities could learn from the external information, which they used and adapted to suit their local situations. However, the present study showed that other than the AIRC and a few NGOs, there was little formal repackaging of information carried out in Kirinyaga district. Although the Ministries of Agriculture and Livestock Development established the AIRC, to manage agricultural information for extensionists and farmers in Kenya, the present study indicate that the AIRC resources had not reached small-scale farmers in Kirinyaga district. It was surprising that despite the various dissemination strategies used by the AIRC for disseminating the content they repackaged for farmers and extensionists such as attendance of agricultural shows, none of the study informants in Kirinyaga district had accessed the AIRC resources. This finding suggests the need to publicise, and decentralise the dissemination of the AIRC resources to rural areas to ensure that agricultural information reached its intended beneficiaries. With regard to repackaging of information, farmers need to be involved when determining what content to develop (Morris and Stilwell 2003; Mchombu 2004:30). Gianatti and Carmody's (2007:171) in Australia demonstrated that collective packaging (growers groups, researchers, the private sector) of information allowed the delivery of new knowledge and skills to be conveyed to groups of farmers. The present study confirmed that farmers need to be involved in the development of dissemination strategies, to ensure the strategies and communication channels delivered the information to farmers.

The present study showed that the few print resources collected by individual farmers and farmers groups were shared with neighbours and group members. Likewise, Stefano *et al.* (2005b:61) found that farmers in South Africa collected and shared print materials with neighbours and friends. The finding of the present study on some farmers' groups not sharing information beyond their group members resulted in exclusion of some community members and information asymmetries. As noted by Evgeniou and Cartwright (2005:297), information asymmetries existed in cases where some groups had information that did not get to other community members who needed it to improve their farming practices (see **section 4.7.5.9**). This finding suggests the need for further research on information asymmetries in farmers' groups.

Morris (2007:19) identified insufficient human resource with the requisite skills as a key barrier in carrying out information and communication management South Africa. Although Dutta (2009:49) suggested that public libraries could be used for disseminating information, the present study found that other than the public library at the district headquarters in Kerugoya, there were no libraries in the interior rural areas. However, there are a number of innovative resource centres and libraries

that are in use in other parts of rural Africa (Stilwell and Munyua 2009), that could be adapted to suit the needs of rural farmers. These findings suggest the need for establishing rural resource centres and equipping them with agricultural materials for farmers.

## **11.2 Managing local agricultural knowledge**

This section presents results and discusses findings on the **research question 5.2: *What systems are in use for managing local agricultural knowledge?*** Results showed that very few farmers were involved in capturing, organising, recording and sharing the local knowledge that they possessed. Results from interviews conducted with individual farmers showed that overall, only 11 (12.5% farmers belonging to a group (N=88)) and 6 (9.5% farmers not belonging to a group (N=63)) respectively managed knowledge, implying that very few farmers were involved in managing knowledge, and that the majority of those who did belonged to groups. The findings from KENRIC, KARI, AIRC and CCS showed that these organisations managed local knowledge and the resources were stored in their offices in Nairobi (except CCS). As result, most of the knowledge recorded was not accessible to farmers in Kirinyaga district. These findings suggest the need for establishing knowledge centres at community level, to ensure the knowledge captured and recorded was available to the community.

### **11.2.1 Capturing and recording local agricultural knowledge**

Data collected from farmers' groups and individual farmers showed that farmers captured important local agricultural knowledge orally from elders, parents, group members, model farmers or neighbours. Supplementary data collected through interviews with research, training and education institutions, NGOs and projects indicated that local knowledge was gained through day-to-day practice. Farmer-research teams or farmers and NGOS captured local innovations through oral discussions, demonstrations and experimentation, while KENRIK captured local knowledge from farmers orally through interviews, through observation, participatory appraisals. Likewise, the AIRC captured knowledge from exhibitions, shows and publications, while the CCS captured knowledge from farmers and through interactions on the farm. KARI captured knowledge from farmers through discussions with farmers, observation, farmer-research teams and at scientific meetings to which farmers were invited. KENFAP captured local knowledge of farmers through discussions and through surveys.

Supplementary information obtained from farmers belonging to a group ascertained that most farmers captured local agricultural knowledge they possessed orally and stored it in their heads. A few farmers were involved in recording of local knowledge through conventional methods. Some groups recorded knowledge in the group's minutes or records book and a few took photographs. Of the 56 groups that captured local knowledge, 30 (53.6%) recorded the information in the group's records book or minutes. The examples presented above in **section 10.3.1**, showed that most group

members recorded local knowledge by writing personal notes in their notebooks. One group kept the instructor's notes (on flip chart sheets), two groups prepared a poster and another produced a publication through project support. Findings obtained through interviews with individual farmers showed that only 11 (12.5%) farmers belonging to a group (N=88), and 6 (9.5%) farmers not belonging to a group (N=63) respectively recorded local agricultural knowledge. This was probably because Kirinyaga district is a high potential area where commercial farming is practiced by small-scale farmers who mainly used modern farming techniques. Some farmers recorded local knowledge on medicinal plants by collecting samples of plant materials and growing them on farms. The reasons for recording local knowledge included to preserve it for future reference and future generations, and to assist other farmers.

Local knowledge captured by KENRIK was synthesised and repackaged in the form of brochures, books, newsletters, documentaries, videos, CD-ROMs and databases. Local knowledge captured by AIRC was recorded in the form of videos, documentaries and publications, while KARI recorded local innovations that they had tested and validated in the form of scientific papers, reports and newsletters.

**Appendix 178** presents narrations of some instances where farmers' groups captured, organised, recorded and stored local knowledge. For example, one group member learned how to treat bloat in cows from a neighbour using *Tithonia* (*Tithonia diversifolia*), Mexican marigold (*Tagetes minuta*) and tobacco. Farmers recorded the knowledge in their heads and made personal notes. The knowledge was shared with other group members during their group meeting and the secretary recorded highlights in the minutes. Another group narrated how they captured information on the control of Newcastle disease in chicken using *Aloe vera*, and using neem (*Azadirachta indica*) to control East Coast Fever in cattle. The knowledge was captured orally from elders and by observing other community members. Some members demonstrated how to prepare the mixture during a group meeting. A different group shared their experience on how they took photographs of some of the indigenous plants they were using for pest management, which were used to make a publication (project funded). The KARI informant narrated some innovations on the preservation of meat through salting, drying and cooking and the treatment of worms in animals using local herbs.

### **11.2.2 Sharing local agricultural knowledge**

As already stated in **section 7.3.1.2**, 50 farmers' groups (58.1%), 62 (61.4%) farmers belonging to a group (N= 101), and 38 (53.5%) farmers not belonging (N=71)) indicated they shared local agricultural knowledge. Some groups shared the knowledge in their group meetings and at a personal level, but most groups said they shared external information and knowledge. The KARI informant pointed out KARI encouraged farmers to share their local knowledge innovations at

scientific meetings narrated how farmers from Rift Valley province had presented the Chepkumbe traditional brooder at the 2008 KARI annual scientific meeting. Farmers used vernacular language (or their preferred language) when making presentations to enable them to communicate using their own local terms and cultures and simultaneous interpretation was provided in English.

A few CSOs including KENRIK shared local knowledge through workshops, training, expert discussions, newsletters, brochures, videos, visitors to their offices, demonstrations and books. KENRIK had a resource centre that was open to the public. The AIRC shared the knowledge through documentaries, videos and publications. KARI shared local innovations that the institute had tested and validated through exhibitions, open days, visits, brochures and scientific conferences. The CCS shared knowledge on local innovations with farmers through training, meetings, demonstrations, knowledge teams, newsletters and books. KENFAP shared knowledge with farmers through videos, newsletters, brochures and training. However, this local knowledge had not benefitted the farmers of Kirinyaga district.

### **11.2.3 Reasons for managing local agricultural knowledge**

Farmers' groups (N=33) captured, organised, recorded and shared local agricultural knowledge in order to help other groups or community members and to preserve the knowledge for future use (29, 87.9%). A few groups indicated that they managed local knowledge to help others to reduce production costs (3, 9.1%) and to substitute synthetic chemicals with organic products in order to improve human health (1, 3%). Findings from individual farmers belonging to a group (N=6) corroborated the results obtained from farmers' groups. This category of farmers also said that they managed knowledge to facilitate learning and the sharing of knowledge.

Discussions with farmers' groups revealed that farmers perceived the local options to be relatively inexpensive compared to conventional agrochemicals and veterinary drugs because the materials were locally available. Some farmers' groups explained that at times farmers did not have money to buy chemicals hence resorted to local knowledge that worked well. One group stated, "We share because we want other farmers to learn and substitute inorganic inputs such as agrochemicals with natural products to improve the quality of human health." The group argued that unlike inorganic inputs, local knowledge solutions had no side effects on human health and the environment hence were more sustainable.

### **11.2.4 Usage of local knowledge that was managed by farmers' groups**

In addition to using external agricultural information and knowledge (see **Section 10.2** and **10.3**), farmers' groups (N=30) used local agricultural knowledge that they captured, organised, recorded and stored at group and individual levels to improve their farming activities (16, 53.4%). For

example, some groups said that they put into practice what they learned through discussions and demonstrations. Some group members narrated how they had used local knowledge to increase milk yields, to store food and grains, to make their own manure and to produce chemical free honey. Others used the knowledge to introduce new technologies and farming methods (5, 16.7%), to control and manage pests and diseases (4, 13.3%), and to improve understanding (3, 10%). One group indicated that they used the knowledge to experiment and another said they recorded the information for future reference (1, 3.3% each). KENRIK indicated that they used local agricultural knowledge to meet the objectives of their organisations by conducting research and sharing the findings with the community and scientific community.

Knowledge is regarded as one of four production factors (in addition to land, labour and capital) (Anderson 1999:339; Spallek 2007:3; Snowden and Stanbridge 2004:141), hence needs to be managed. For Anderson (1999), managing knowledge entailed providing platforms in which individual, team or organisational knowledge could flow and be used to increase efficiency and innovation. Emphasising the importance of managing knowledge, Ngulube (2002:95) stated, “the success of humankind is going to largely depend on gathering, analyzing, storing, sharing and harnessing what other members of society know.” Many authors have emphasised the need to manage local knowledge (Chisenga 2002:17; Ngulube 2002:98; Chikonzo 2006:138).

The present study and other authors (Mchombu 1991:173; Kibwana 2001:50; Modi 2003:683) established that farmers are knowledgeable and resourceful. Two areas for knowledge management were identified in the study. i) The knowledge that was embedded in the minds of people that was generated and utilised but was not transferred as was the case with the different actors in an AKIS (Röling 1988:32) presented above. ii) The managing of the knowledge assets acquired by small-scale farmers and groups from other sources. The knowledge in the AKIS, which was largely tacit and created through practice, captured and recorded in people’s heads, and shared through practice and interactions with others was a subset of the knowledge in knowledge management.

As defined in **section 4.1.6**, knowledge management pertains to first identifying the knowledge, then explaining it in a manner that it can be easily and formally shared (Turban *et al.* 2001:451), as well as managing people, their knowledge assets and interactions in their daily activities (Abdullah *et al.* (2006). Experience of organisations, or in the context of the present study farmers’ groups, can be captured and integrated into regular operations to help alter processes and improve effectiveness and performance in different ways including maintaining institutional memories (Cross and Baird 2000:69-70). As pointed out by Snowden and Stanbridge (2004:141), managing knowledge is a strategic activity given that it relates directly to learning and is useful for innovation. Besides, the “wholes” are better equipped at handling different types and sources of knowledge (Engel 1997:40)

than the parts or individuals. Managing the larger set of knowledge entails people, processes and technology (Turnbun 2002; Dalkir 2005:3).

Bodhanya (2008:3,20) described knowledge as a “critical resource” that is indispensable to the success of organisations. To benefit from the value of knowledge, the knowledge on local innovations (see **section 10.3.5**) and other applications for pest and disease control, soil and water conservation and postharvest methods needed to be managed so they could be accessible to more farmers. The present study showed that farmers in Kirinyaga district applied local knowledge successfully to increase milk yields, to store food and grains, process manure, produce organic products and to control pests and diseases. This finding supported the assertion that knowledge management is a “way of thinking” that draws from what has been neglected that would otherwise have been overlooked (Rollet 2003:209).

The World Bank’s (1998) report emphasised the importance of understanding how communities captured and used knowledge. Other authors (Davenport and Prusak 2000:18; Kaniki and Mphahlele 2002:7; Whyte 2004:4) also stressed the need to facilitate the generation, sharing and use of knowledge for improved efficiency and development. The present study showed that there were very few farmers, farmers’ groups and organisations in Kirinyaga district that captured, recorded and shared knowledge because of the tacit nature of local knowledge and the oral culture and tradition that was prevalent in Kirinyaga district. These findings confirmed Ibui (2007:263-276), who showed that little attention had been devoted to managing the local knowledge of communities in Kenya (see **section 4.7.6.2**). Similar observations were made in Tanzania (Ngulube and Lwoga 2009:101). The tacit nature of knowledge made it difficult for other people who needed the knowledge to access it. This finding suggests the need to step up activities centered on managing local knowledge gained through day-to-day operational practices, experiences and apprenticeships, and that passed on by earlier generations. Knowledge management theory (see **section 3.2.1.2**), which stems from the interpretive (see **section 3.1.2.2**) and postmodernists philosophy (Styhre 2003) provided the lens for understanding some of the knowledge management processes.

*Capturing and recording:* The findings of the present study showed that farmers had valuable knowledge on farming. Although some researchers failed to capitalise on the local knowledge of farmers, research had shown that farmers, groups, and communities were custodians of invaluable local knowledge and expertise for managing their farms sustainably (South Africa. Department of Agriculture 1995:22; Kibwana 2001:50; Ndungu, Nkonge and Rees 2001; Dinucci and Fre 2003:1,10-23; Stefano 2004:51). However, this knowledge is scattered, and becomes of value when it is captured and made accessible so that its value can be exploited (Davenport and Prusak 2000:18,81). The present study showed that most knowledge was captured orally “*in situ*” through face-to-face



interactions with elders or neighbours in a community, parents in the family, farmers in their groups, or farmers on their farms. The findings were similar to Gîchere *et al.*'s (2008:26) in Kenya.

Knowledge management theory underpinned the aspects of the study to do with knowledge being socially constructed (Sveiby 1997:30; Styhre 2003:21) and associated with the culture (Kohlbacher and Krähe 2007; Mchombu 2007:39), beliefs and communication practices of a particular community (Styhre 2003:149). The present study found that local knowledge was captured through farmers' groups such as FFSs (see **section 7.3.3**), which based the learning on farmers' own knowledge and practices. The local knowledge captured in farmers' heads was complemented with external knowledge from facilitators (Malekmohammadi 2009:233). These findings suggest the need for participatory approaches such as FFSs that provide platforms for capturing agricultural knowledge.

The present study identified various challenges associated with the capturing of local knowledge, including the need to codify it; not knowing where to find the knowledge; IPR issues, the lack of a culture for sharing and the embeddedness of knowledge in the expertise and practices of individuals. These barriers corroborated those identified by Skyrme (1997; 1999) and Nwokeabia (2006:3). A set back to capturing knowledge by word of mouth through family, peer groups, elders and folklore was that the oral communication made it vulnerable to alteration or disappearance (IIRR 1996:13). As pointed out by Gîchere (2008:4), some of the elders who were aged above 80 years old were "walking libraries" and primary sources of knowledge that was invaluable. The present study's findings and those of other authors pointed to the need to carry out a knowledge audit to capture the knowers of knowledge.

Whether individual or group knowledge, tacit knowledge is personalised and needs to be codified before it is recorded to ensure receivers could interpret it (Alavi and Leidner 2001:110). The present study showed that there was little activity in terms of formally recording and documenting local knowledge. These findings verified empirical evidence provided by Nwokeabia's (2006:2) study, which showed that although 90% of local agriculturalists in Africa generated new knowledge and innovation, none of them formally recorded it. The present study showed that most knowledge was tacit and was "recorded" in people's heads, personal notebooks and group minutes. Group minutes were thus a form of institutional memory of knowledge. These findings support Choo (2000:397) and Abdullah *et al.* (2006), who observed that people's heads were repositories of accumulated knowledge in the form of facts, events and procedures. Many authors (Ibui 2007:263-276; Borgman 2008:19-20,28; Gîchere 2008:4) acknowledged the difficulty and importance of recording this knowledge for future generations.

The study by Nwokeabia (2006:3) revealed more willingness to document and share indigenous innovations in communities where knowledge sharing networks had been established. This finding emphasised the aspect of the knowledge management theory that underpins the intellectual property.

**Section 4.7.6.2** outlined other methods through which knowledge was recorded. Community knowledge resource centres had been established in some areas, and farmers had been trained to capture and document their own knowledge (Von Liebenstein 2000:20). Another example is the LinKS project in Tanzania, which had used community-based approaches to document good practices for the management of agrobiodiversity and the local knowledge of men and women on conservation of agrobiodiversity in form of reports, case studies, articles, videos and leaflets. These products helped to raise awareness on the value of local knowledge systems (FAO LinKS Project 2003).

Farmers' groups in Morogoro region, Tanzania were documenting their knowledge on crop protection in people's heads, by developing posters, booklets and leaflets, which were shared orally through farmer-to-farmer dissemination workshops (Mgumia 2001:2). Apart from the traditional methods of recording local knowledge, many authors (The World Bank 1998:13; Pidatala and Khan 2003:3; Jain 2006:64) have emphasised the potential of ICTs for capturing, recording, documenting and sharing local knowledge. However, the present study showed that there was only one farmers' group that had applied ICTs in managing local knowledge in Kirinyaga district. Some local knowledge management initiatives in Kenya that had harnessed the potential of ICTs included the Open Knowledge Network (OKN), ALIN-EA and AfriAfya, which had established knowledge centres or access points that captured, recorded, documented and shared local knowledge in English and Kiswahili in the form of "stories." The content was uploaded on a web-based platform and was shared widely through internet, e-mail, databases, cellular phone, video, print and through face-to-face interactions (Munyua and Mureithi 2003). The stories were captured in English or Kiswahili and were shared with the wider Eastern Africa community through WorldSpace technology. Other institutions such as KENRIK, the Centre for Indigenous Knowledge Systems and By-products (CIKAP) and the Indigenous Information Network (IIN) had developed databases, videos, booklets and brochures. In their audit of indigenous knowledge systems in Kenya, Njiraini, Ocholla and Le Roux (2008) captured additional institutions engaged in recording indigenous knowledge systems in Kenya. Such initiatives need to be merged into a national knowledge base. As observed by Raseroka (2008:247), knowledge centres had been established in a number of developed and developing countries to manage indigenous and other knowledge systems.

Other initiatives on recording knowledge in Kenya and elsewhere were discussed in **section 4.7.6.2**. NGOs such as PELUM 2009, PROLINNOVA and Oxfam Novib (2006; 2009) had initiated farmer led documentation initiatives that captured, recorded and documented local innovations through



traditional methods such as storytelling, dance and drama, as well as using ICTs including video and digital photos. The participatory video approach had also been used (Lunch 2004:1). In India, the government had supported the establishment of the Traditional Knowledge Digital Library (TKDL), which captured public domain information on important medicinal plants (Sen 2005:379). Other methods through which local knowledge has been recorded for use include cassette tapes, video, films, photographs or drawings, slides and databases (IIRR 1996:109; Woytek 1998:6-8). Although it is widely acknowledged that ICTs played a key role in facilitating the capture, recording and sharing of knowledge, various authors (Chisenga 2002:19; Chikonzonzo 2006:138; Raseroka 2008:247; Ngulube and Lwoga 2009:105) observed that the knowledge captured and recorded did not benefit the owners of the knowledge, as most of them did not have access to ICT facilities due to inadequate infrastructure among other reasons.

Lunch (2004:1) observed that most local knowledge was recorded and documented by external institutions. For example, the World Bank had established a website, which hosted a database on local knowledge, various publications and learning tools through its Indigenous Knowledge for Development Programme (The World Bank 2009b). The database had room for growth, as it had around 300 entries, and according to Ocholla (2007:239), only 17 were on Kenya. The TKDL example and efforts made by The World Bank (2009b) pointed to collaborative opportunities, where local actors in Kirinyaga district could work with the government and international institutions to capture local content and feed the input into national and international knowledge systems. The findings of the present study and those of other authors (Sen 2005:379; The World Bank 2009b) imply that there was a need for developing standardised guidelines for capturing and recording local knowledge to facilitate information and knowledge exchange and interoperability.

*Sharing:* The findings of the present study showed that although more than half the farmers and farmers' groups shared local knowledge, more than two fifths did not share. Details on who, how and why farmers shared or did not share were outlined in **section 7.3**. The channels used by farmers who shared local knowledge included group meetings, informal and formal discussions, and observation. Likewise, Malekmohammadi (2009:233) established that farmers shared knowledge through farmers' meetings, field observations, field days and media. Von Krogh, Ichijo and Nonaka (2000:83) pointed out that tacit knowledge was embedded in personal experiences hence could not be easily passed on to others. Sharing this type of knowledge required "physical proximity" through direct observation, narration, imitation, experimentation and comparison and group work. Building upon the view by Von Krogh, Ichijo and Nonaka (2000:vii,7,54-55) that knowledge cannot be managed but rather, it can be enabled through creating shared space that fosters linkages and relationships, it is recommended that linkages between actors be strengthened and farmers who are not in groups organise themselves into groups to improve the sharing and exchange of knowledge.

The high figure that did not share knowledge was not surprising because as pointed out by Probst, Raub and Romhardt (2000:173) people did not “automatically” share their knowledge assets because of personal barriers. For example, the findings of the present study showed that some farmers’ groups regarded knowledge as a private good belonging to their groups, hence did not share what they knew with non group members. The finding on the non sharing culture was corroborated by many authors (Karamagi Akiiki 2006:74; Nwokeabia 2006:1-2; May, Karugia and Ndokweni 2007). Some individuals regarded some of their knowledge assets as a source of power, which affected their propensity to share because they did not want to weaken their positions over competitors (Probst, Raub and Romhardt 2000:173,192-194; Bagnall-Oakeley and Ocilaje 2002). Besides personal barriers, the present study found cultural barriers, lack of trust and time factors in relationship to work schedules. In some cases, people who had tacit knowledge were not able to articulate that knowledge and communicate it to others. Other reasons for not sharing included indifference (Nwokeabia 2006:2) and some people needed incentives to induce sharing (Nan 2008:104,107,111).

Linked to the non-sharing culture, the findings of the present study confirmed Karamagi Akiiki’s (2006:70) observation that there was little knowledge sharing in rural areas. This finding was in line with Nwokeabia’s (2006:2), which showed that although most farmers generated new knowledge and innovation, only 1% shared the innovations proactively. Many authors (Mchombu 1991; Mundy and Compton 1995; IIRR 1996:13; The World Bank 1998; Mulira *et al.* 1999:486; Stefano *et al.* 2005b) established that local knowledge was shared orally, and farmers learned through experience (Mchombu 1991:173). For example, Mulira *et al.* (1999:486) observed that in Kenya, the old people had passed on knowledge on traditional treatment of livestock diseases to the young orally, while Stefano *et al.* (2005b) found that in South Africa, the older generation had passed on agricultural knowledge to the younger generations. The preference for oral communication is partially explained by the African tradition which is rooted in oral communication, and partially because most local knowledge was tacit hence was not easily codified and therefore was communicated orally (Raseroka 2008:246) and through traditional methods such as stories, drama and folklore.

The present study showed that small-scale farmers’ groups captured, recorded and shared knowledge within their groups and social networks. Group members shared local knowledge through interactions and by working with farmers who were applying local knowledge. In addition, farmers belonging to groups were adding value to the knowledge by experimenting and sharing their findings through CoPs, such as FFSSs. Likewise, Cross and Baird 2000:69-70) found that members of an organisation learned from their experiences by tapping into each other’s knowledge on a continuous basis. As pointed out by many authors (Choo 1998; Wenger 1998; 1999; Benzie *et al.* 2005:180,182; Du Plessis 2007:27-28), tacit knowledge was shared through a network of roles and relationships and

managed through CoPs (see **section 3.2.1.3**), and “the social bonding among a group’s members ...[was] important” (Cross and Baird 2000:75). This finding suggests that there was less sharing of local knowledge among farmers who did not belong to a group or other social networks, leading to information asymmetries. The finding on few farmers capturing and sharing local knowledge, and those of others (Kaniki and Mphahlele 2002:14; Skyrme 2002; Ocholla 2007:244) point to the need for policies on local knowledge to address the factors inhibiting the owners of knowledge from sharing.

The present study did not reflect the use of modern ICTs in sharing local agricultural knowledge. This was not surprising considering the low usage of ICTs in general in accessing agricultural information and knowledge. As noted by Sen (2005:377), modern ICTs are not commonly used for disseminating local knowledge between communities, but were valuable for capturing, recording and sharing of local knowledge across telecommunication networks. Chikonzo (2006:137-138) identified a number of challenges in the use of ICTs in the collection, preservation and dissemination of local knowledge including poor telecommunication and electricity infrastructure, high cost for ICT service, inadequate funding and skills on using ICT tools, which are discussed in detail in **section 9.5**. Other authors (Chisenga 2002:19; Chikonzo 2006; Jain 2006) have also pointed out the potential of ICTs in managing local knowledge, and as pointed out by Fourie and Bothma (2006:470), the world wide web is vital in facilitating the sharing of knowledge.

Other avenues of sharing local knowledge included knowledge fairs (Davenport and Prusak 2000:46,92; McDermott 2003:30; Karamagi Akiiki 2006:75). Knowledge fairs have been defined as temporary gatherings of people, where they visit and chat about their work or experiences (Davenport and Prusak 1998:46,92), for example at trade shows or farmers markets. In Uganda, BROSDI used knowledge fairs and forums to share and disseminate agricultural knowledge and information by displaying their expertise and innovations (Karamagi Akiiki 2006:75). Knowledge was also shared through the After Action Reviews (AARs) (Cross and Baird 2000:73; Baird, Deacon and Holland 2000:187). Additional methods for sharing included mentoring and apprenticeships (Davenport and Prusak 2000:46,81), virtual teams linking the different agricultural actors within an AKIS (Alavi and Tiwana 2002:1035) and knowledge communities (McDermott and Snyder 2002:6).

To improve the sharing of knowledge, the “knowers” and “generators” of knowledge needed to be motivated to share knowledge by compensating and rewarding them for their contribution (Kaniki and Mphahlele 2002:9). In addition, trust and respect for IPR were requirements for openness and sharing of local knowledge (Spalleck 2007:5). Probst, Raub and Romhardt (2000:vii) described trust as “a fertile ground for many knowledge related processes.” Trust in others to some extent pointed to knowledge an individual did not have and counted on others to add value to their knowledge (Von

Krogh, Ichijo and Nonaka 2000:49). As emphasised by Davenport and Prusak (2000:34-35), “Without trust, knowledge initiatives will fail,” hence people needed to be credited for sharing and the sharing process needed to be reciprocal and “ubiquitous” to avoid knowledge asymmetries. These findings suggest the need to create forums or platforms that facilitated the capturing, recording and sharing of local innovations as well as learning. The present study’s and other authors’ findings on the lack of platforms for sharing local knowledge suggest the need to promote knowledge fairs, after action reviews, or exhibitions either as stand alone activities or as components of on-going activities such as agricultural shows and exhibitions to facilitate the sharing of local knowledge.

*Usage:* The bottom line of knowledge management is to ensure the knowledge captured and skills learned are applied in everyday activities (Probst, Raub and Romhardt (2000:32). The present study showed very few groups responded to the question on usage of knowledge management and out of the 30 that responded, only 16 (53.4%) used local knowledge to improve farming practices, understanding or for experimentation. This finding confirmed the findings of earlier authors (Abbott 1989:2; Buchanan-Smith, Davis and Petty 1994; Aina, Kaniki and Ojiambo 1995; Rosenberg 1995; IIRR 1996; Meyer 2000:209,214; Adomi, Ogbomo and Inoni 2003; Harris 2004), who established that knowledge and information were underutilised. According to Probst, Raub and Romhardt (2000:1), “knowledge is the only resource that increases with use.” Knowledge that was shared was given new meaning by the receivers by integrating it with the experiences or mental models of individuals, and through sense making and it was subsequently changed and adapted (Sveiby 1997). As stated by one farmers’ group in Kirinyaga, they learned more when they shared what they knew with others. The mental models of each individual user helped the farmers to become conscious of, and give meaning based on their own world (Nonaka and Takeuchi 1995:60), their own culture (Kaniki and Mphahlele 2002:4), and based on the social and economic contexts. Koutsouris and Papadopoulos (1989:89) emphasised that local knowledge was a requisite to understanding the complex farming systems of small-scale farmers, and for solving local problems (Warren 1991). Supporting the need to use local knowledge, Oettie and Koelle (2003:9) pointed out that rural communities had a great strength, that is, their local knowledge and “know how” about medicinal plants, environmental management and sustainable traditional agricultural practices, and “farmers have been developing agricultural practices and innovations without the contributions of modern science” (Hoffmann, Probst and Christinck 2007:356).

Drawing from Davenport and Prusak’s (2000:xii) work on managing organisational knowledge in organisational contexts, agricultural actors need to “create a culture that values the creation, sharing, and use of knowledge.” Despite its importance, Mgumia (2001:2) observed that the main users of local knowledge were the poorer farmers who could not afford inputs. Besides, various authors (Kaniki and Mphahlele 2002:14) observed that knowledge management activities were carried out as

“one-off-process[es].” Kaniki and Mphahlele (2002) advised against the project approach and suggested that knowledge be managed continuously to enable people to share and create new knowledge. The present study observed that the few conventional knowledge management initiatives in Kirinyaga district were one-off project based processes, and confirmed the observation by Aina, Kaniki and Ojiambo (1995:vii) that most African governments pay little attention to the provision of agricultural information. The findings by Kaniki and Mphahlele (2002:14) and those of the present study imply the need for collaboration between actors from different sectors and continuous funding to support the management of external and local knowledge. Njiraini, Ocholla and Le Roux (2008:19) also established the need to create a central database for local knowledge systems to promote access and use of local knowledge. These findings suggest the need for comprehensive policies and strategies that promote knowledge management at all levels.

*Reasons for managing local knowledge:* Apart from the reasons cited above for managing local knowledge, many authors have underscored the need to manage knowledge (Warren 1991; Kaniki and Mphahlele 2002:2; Jain (2006:58,63). Farmers managed knowledge to help solve problems (Warren 1991; Kaniki and Mphahlele 2002:2), to facilitate innovation and social learning (Engel 1997:40), and to ensure the effective running of an AKIS (Asopa and Beye 1997b). Jain (2006:58,63) posited that knowledge should be managed to showcase the knowledge of local people. In addition, local knowledge was a strategic asset of farmers and managing it institutionalised the knowledge and made it accessible to the wider community. Farmers’ groups in Kirinyaga managed local knowledge for social, economic and environmental reasons.

Knowledge management facilitated CoPs through interactions between individual farmers and farmers’ groups who shared common objectives, interests and problems and helped farmers to collectively discuss common issues. These interactions deepened the understanding of members of the CoP (Wenger, McDermott and Snyder 2002:4-6, 24-25). Aligning the study findings to the work of Wenger, McDermott and Snyder (2002), it could be said that the interactive sessions of farmers’ groups acted as learning communities or “learning space[s].” Where tacit and explicit knowledge were combined and shared, further knowledge was created (Nilsen 2006:5), expanded and exchanged to develop individual and group capabilities (Wenger 1998; 1999; Wenger, McDermott and Snyder 2002:42). According to Wenger, McDermott and Snyder (2002:6), CoPs bind the whole system around core knowledge requirements by connecting people within and without organisations and across business units. Farmers also managed knowledge to enhance networking skills, share best practices and build institutional memories (Dalkir 2005:20). These findings emphasised the significance of managing knowledge, and suggest the need for formulating appropriate policies and strategies that facilitate the capture, recording, sharing and use of local knowledge.



Knowledge management maximises the effectiveness of explicit and tacit knowledge as well as undocumented knowledge (IBM 2001). In the context of AKIS, linkages facilitate knowledge management by enabling the flow of knowledge and information (Salomon and Engel 1997a:75). Knowledge management facilitates the capturing, recording and sharing of valuable knowledge generated and shared within the AKIS through participatory activities and practices or interactions between actors (Malekmohammadi 2009:233). The fabric that held the different actors within an AKIS together comprised the unique information and knowledge assets that different actors held, and the manner in which information and knowledge flowed between actors. The strengthening of linkages between actors thus partially entailed the improvement of flows of information and knowledge between actors, which was facilitated by information and knowledge management.

Although personal relationships were important in managing knowledge, technology plays a key role in facilitating the sharing and exchange of knowledge, and for preserving knowledge through repositories (Cross and Baird 2000:71). This study endorses the recommendation by Whyte (2004:4) of building the capacity of local people to use appropriate ICTs to capture and document local knowledge. Further, the findings of the present study support the recommendation by Chikonzo (2006:138) on the need for the government to provide funding for the collecting, recording and sharing of local knowledge. In Kenya, some progress has been made, and with support from the World Bank, the Kenya Agricultural Productivity and Agribusiness Project (KAPAP) (RoK. KAPAP 2009:13) plans to work with 59 districts in Kenya to capture and document details on marginalised indigenous peoples of Kenya. Some knowledge of the Ogiek and Sengwer peoples has been documented. In addition to documenting knowledge on the indigenous peoples of Kenya, these findings suggest the need for documenting other branches of local knowledge.

### **11.3 Summary**

Chapter eleven captured the processes through which external agricultural information was collected, processed, stored, disseminated and used. The Chapter determined the current practices on how local knowledge was captured, recorded, shared and used, and discussed the reasons for managing external agricultural information and local knowledge. The findings showed that although there was no bibliographic control of agricultural information resources, and knowledge management practices in rural areas, farmers valued external information and used their own traditional methods to manage the resources. Farmers managed local knowledge passed on orally from elders to the younger generations through CoPs and through traditional methods. Although ICTs had not been exploited for managing information and knowledge in Kirinyaga, they held great potential as demonstrated elsewhere in Kenya and other African countries.

# CHAPTER TWELVE: FARMERS' SUGGESTIONS FOR AN IMPROVED AKIS, THEIR CONCLUDING COMMENTS AND THE SUGGESTED AKIS MODEL

## 12.0 Introduction

Chapter twelve presents and interprets findings on aspects of **research objective six: Suggest an AKIS model for small-scale farmers in Kirinyaga district**. The Chapter presents suggestions drawn from key findings of the study and others from the study informants on improving and strengthening the linkages and sharing of agricultural information and knowledge, as well as on enhancing the AKIS of small-scale farmers in Kirinyaga district. Data for this section was collected through interviews with all categories of the study informants, focus group discussions with farmers' groups, PRA, RAAKS data and from secondary information sources.

## 12.1 Suggestions for improved sharing and exchange of knowledge and information

Farmers belonging to a group (N=83) and those not belonging to a group (N=54) were asked what they would like to see in the community in relation to external, local knowledge if they had power. There was corroboration in the findings from the two categories of farmers, with the primary needs and wants being more training, learning opportunities, demonstrations, field days and exchange visits (27, 23.1% for farmers belonging to a group versus 13, 18.3% for farmers not belonging to a group), increase the number of information providers (13, 11.1% versus 14, 19.7% for farmers not belonging to a group) improved access to information, knowledge and technologies (13, 11.1% versus 5, 7%). **Appendix 170** lists additional needs and wants for information and knowledge. Informants were asked to suggest ways through which linkages could be strengthened and how the sharing of agricultural information and knowledge in the community could be improved. The responses provided were similar to concluding remarks hence are presented together under **section 12.2**.

## 12.2 Concluding comments from informants

In concluding the interviews, informants were asked to state whether they had anything they wanted to add or comment on. This section summarises the main themes that emerged from the suggestions for an improved AKIS and concluding remarks. The emerging themes included: the need for strengthening human and infrastructure capacity; repackaging of appropriate and relevant content; availing more information and knowledge resources and improving access to existing resources; inculcating an information seeking behaviour; improving communication methods; improving electricity, ICT and road infrastructure; strengthening linkages between actors; improving marketing and prices; facilitating access to agricultural credit and funding. Others commented on general challenges in the agricultural sector such as the high cost of inputs, high production costs, selling of counterfeit inputs, land tenure and feedback on research conducted. Some of the comments provided

by farmers expounded on issues raised in earlier chapters, while others provided solutions to some of the barriers and constraints outlined in **section 10.5**. It was not surprising that the informants “poured out” many thoughts, feelings, emotions, wants and dreams about the many challenges they faced and solutions on what could be done to improve small-scale farming. The challenges that small-scale farmers faced have been documented by many authors (UNDP 2005; UNECA 2005b; Jones 2006; Richardson 2006; Mukhebi *et al.* 2007; Munyua, Adera and Jensen 2009). Highlights under the themes emerging from the suggestions, comments and conclusions shared are presented below.

#### *Strengthening human and institutional capacities*

- Strengthening human capacity by increasing the number of extension officers and other service providers.
- Many farmers’ groups and individual farmers suggested the need for strengthening the capacities of farmers’ groups through organisational development, training in leadership skills among groups, increasing the number of training institutions, training stockists to equip them with agricultural knowledge to provide answers to farmers’ questions.
- Strengthening the capacity of research to meet the needs of farmers and maintaining permanent demonstration sites for farmers to visit and learn.
- Training of stockists by actors from extension and input manufacturers to equip them with skills on the products they stocked.
- Special groups such as the youth pointed out that they faced challenges in farming because they did not own land, hence had no access to credit (title deeds are often used as collateral), and called for government intervention to enable them to engage in farming.

#### *Collaboration and strengthening linkages between actors*

- Strengthening information and knowledge sharing platforms by encouraging the formation of farmers’ groups. Some informants stated “Hold joint planning meetings, demonstrations and work jointly in implementation,” “Have more cooperation from community members” and “Researchers should work with farmers in the field.”
- Most informants stressed the need to improve linkages between actors and get them to collaborate and work together in serving farmers and on projects, programmes and other initiatives through the stakeholder forum. Others emphasised the importance of providing linkages to credit to help farmers to purchase inputs and access other production factors such as leasing land, paying for labour and paying for information and knowledge.



### *Agricultural training, information and knowledge*

- A few informants acknowledged the poor information seeking culture and stressed the need to be more proactive in seeking information and knowledge. One informant remarked, “The rural people should take the initiative of sourcing for information and knowledge from other institutions,” while another stated “Encourage the community to seek more information.”
- Provision of more and regular training, seminars, exchange visits, tours, demonstrations, field days, shows, barazas at location and sub-location level.
- Farmers’ groups suggested the need for more frequent visits by information providers (especially extensionists) while individual farmers recommended that fees for agricultural training for farmers be waived to enable more farmers to acquire farming skills. Responses from many individual farmers suggested that some farmers were not aware that they were supposed to demand services and had their minds set on the traditional extension services of extensionists visiting farmers’ at their farms.
- Having permanent information desks in the community to facilitate access to information and knowledge. A few informants indicated that there was a need to establish information resource centres equipped with audio visual and internet facilities. One informant suggested the creation of information centres at market centres that provide agricultural information and display or announce market information.
- Repackaging relevant content in appropriate formats and language to suit the needs of farmers. Some informants stated, “Increase agricultural content and coverage on media and local knowledge should not be left out,” “Bring all the actors together and prepare print farmer materials” and “Translate available print materials into local language.” Others suggested that research institutions and the private sector should play a more active role in repackaging and disseminating information to farmers. The physically challenged farmers raised the need for special consideration when repackaging agricultural content, for example for the blind, the deaf and the dumb.

### *Improved communication*

- Informants suggested the need for improved communication methods and systems, to improve delivery of information using simple language, and having regular meetings to share information and knowledge.
- Others suggested using the provincial / district administration and posters at strategic locations and the media to publicise training so more farmers could attend.
- Informants expressed the need to improve the road infrastructure to facilitate transportation of farmers’ produce to markets and to enable information providers to reach the interior and under serviced areas. Others called for water for domestic use and for irrigation. Many touched on the

need to improve the rural electricity and ICT infrastructure to enable farmers to use ICTs for accessing agricultural information.

- A major issue of concern to many farmers was the lack of feedback on research conducted on farmers by researchers. One informant articulated that information service providers should leave their contact details with farmers for follow up and backstopping. One informant stated, “I have taken a lot of time answering the questions and would like to see results and outcome of this research.”
- Many informants emphasised the need to provide transport for field extension staff to enable them to reach many farmers in their catchment areas.

#### *Improved market chains, access to markets and price information*

- Many informants emphasised the need to improve the market chain, find new markets and provide marketing and price information. One informant stated, “What bothers farmers much is markets. It is the intermediaries who benefit from farming not farmers. The government should step in and help us find good markets and market information.” Another suggested, “The government should streamline marketing channels, facilitate linkages to marketing organisations and regulate prices.” Others suggested intervention on liberalisation of markets and pointed out that they were losing their market shares to cheap competing imports. Some highlighted the gap of insufficient and in some cases lack of market information and emphasised the need to repackaging relevant local market information and provide training on marketing.

#### *Streamline contractual arrangements*

- Farmers experienced challenges with the current contracts that they had with horticultural exporters, because most had been drawn up without their input and perceived them to be exploitative. One farmer summarised their sentiments “The government should provide support to farmers to ensure that proper contracts were developed and signed between exporting companies and farmers.”

In sum, informants of the study were happy about the present research and many said they had learned a lot by participating as expressed in their remarks: “Thank you for coming to find out the problems affecting farmers in our area;” “This type of research will help us to access more knowledge and information;” “The research is good and these ideas should be implemented in order to eradicate hunger and poverty;” “The recommendations of this research should be implemented for the sake of farmers;” and “We would want to see the outcome of this research.” The study findings will be communicated to farmers in Kirinyaga district through a dissemination workshop in collaboration with the Ministry of Agriculture.

### 12.3 The proposed flexible AKIS model for small-scale farmers in Kirinyaga district

This section suggests a flexible AKIS model for small-scale farmers in Kirinyaga district based on the findings of the present study, a review of earlier AKIS models and studies (see **sections 4.6 and 4.8**), and suggestions made by farmers in the concluding remarks (see **section 12.2**). The model shifts attention from, but builds upon the framework of the three (triangle) pillar knowledge triangle, and four pillar (rectangle) AKIS models, the Pakistan model, the Comprehensive AKIS / RD model, and Chipeta's multifaceted model of advantages of producer and community organisations (see **section 4.8**), as well as Meyer's merger model for information transfer to rural communities (see **section 3.2.3.2**). In essence, the model supports and advances the work of many authors (Engel 1997:40; Salomon and Engel 1997; Rees *et al.* 2000:5; Modi 2003:683; Davis, K. E. 2004:204-206; 2006; Röling 2004:7; Place *et al.* 2004:258,259; Curtis and Cook 2006; Hooton *et al.* 2006; Braun *et al.* 2007:19; Hoffmann, Probst and Christinck 2007:359), who recognised farmers and farmers' groups as important actors and not just as producers and receivers of information and knowledge, but as innovators, generators, integrators and disseminators of agricultural information and knowledge, and as gateways to diverse agriculture related services.

Röling (2004:5) argued that pre-determining the components of an AKIS *a priori* creates "blind spots," and takes away the need to determine who the key actors are. The proposed model thus builds upon Röling's (2004:7) assertion that the constituent elements of an AKIS were arbitrary and fluid as opposed to being a generalised or idealised model, and the components should be determined *a posteriori*. In this regard, the model is developed after gathering empirical evidence on the key components of the AKIS of Kirinyaga district and knowledge systems in place in the district. The model is flexible and is applicable for now but may change with the dynamics of actors that are active in the district. As pointed out by Röling (2004:14), an AKIS is a temporary configuration of actors and institutions that share a specific interest in a given situation, and were relevant to turning around agricultural development. Anderson (1999:342) pointed out that the economic liberalisation has disturbed the status quo in many sectors, and governments were no longer able to offer some services that were once exclusively offered by the government such as extension services. Hence, the private sector and CSOs have increasingly filled in the vacuum. The present study identified the government, the private sector, producers, CSOs, the media and local markets as key pillars in providing agricultural knowledge and information to small-scale farmers. The proposed model unpacked the category of producers to include small-scale farmers, farmers' groups, associations, cooperatives, committees and neighbours.

The proposed AKIS model for small-scale farmers in Kirinyaga district is inclusive. In addition to research, extension and training and education institutions, other fundamental players including: i) government, ii) the private sector, iii) farmers' groups, other farmers and neighbours, iv) civil society,

v) media and vi) markets which emerged as critical actors in the context of an AKIS of small-scale farmers in Kirinyaga district were added to the model. Berdegúe and Escobar (2001:36) also underscored the importance of market forces and profit opportunities and pointed out that AKISs were market-driven. Likewise, Chipeta's (2004:7) model recognised the importance of market outlets (see **section 4.8**). The proposed model recognises the extension, education and research functions, and factors in a virtual function for support systems that provides inputs, agricultural services, credit and advisory services (see **Figure 61**) adapted from the Comprehensive AKIS / RD model (Rivera, Qamar and Mwandemere 2005:7). These functions were offered by multiple actors. As pointed out by Rees *et al.* (2000:4), linkages between actors were brought about by activities such as service and market linkages. Although, Chipeta's (2004:7) model factored in information dissemination and sharing of experiences, it did not highlight the key actors facilitating the flow of agricultural information and knowledge. It is, however, emphasised that the proposed model is fluid and would work under the present context but is likely to change if the situation changes, or if the dynamics of the actors in Kirinyaga district change, hence should shift based on the sense made out of new situations.

The proposed model is enriched by the inclusion of the two knowledge traditions (external and local knowledge) that flows between the actors within the AKIS to improve agricultural productivity. The local and external knowledge systems are continuously feeding into each other as depicted in **Figure 61**. Röling (1989:2) stated, "An important task of the AKIS is, therefore, to be a 'market' for the supply and demand for information" [and knowledge]. As established by the present study and highlighted by Meyer's (2000) merger model, farmers combined external agricultural information and local knowledge to improve agricultural production. Furthermore, Adenso Okyere, Davis and Aredo (2008:3) emphasised that increasing the flows of knowledge from the different knowledge systems increased exposure of "what is known to what is not known," thus enabling its collection, use and sharing. The shared knowledge supported agricultural production and innovation.

Supporting the efficient generation, sharing and use of information and knowledge within an AKIS requires additional external non-system components such as communication (formal and informal, and traditional and modern ICTs), physical and human resources, institutional commitment as well as supportive national and international policy (adapted from the comprehensive AKIS / RD model proposed by Rivera, Qamar and Mwandemere (2005:7), which was based on the Pakistan model (see **section 4.8**). The proposed model depicts these external non-system components as pillars supporting the platform on which the actors interact and innovate "theatre of innovation" (see **Figure 61**).

The literature review and findings of the present study highlighted the role of traditional communication channels and ICTs and in particular radio, TV and the cellular phone as important tools in facilitating communication of knowledge and information within the AKIS. Rivera, Qamar and Mwandemere (2005:70), emphasised the need for continuous communication between information producers and users in order to ensure effective linkages. Other authors (Mukhebi *et al.* 2007:23; Karamagi Akiiki 2008:16; Mangstl 2008:5; Gakuru, Winters and Stepman 2009) highlighted the key role of modern ICT tools in providing platforms for sharing external and local knowledge. The proposed model thus adds traditional communication and ICTs to the non-system element of rural development communication.

Röling (1989:32) acknowledged that policy was a prime mover and played a crucial role in an AKIS and placed policy outside the AKIS. The findings of the present study concurred with Röling (1989:32), and empirical evidence showed policy as influential in the sub-industries of various enterprises such as cotton (see **section 9.2.4**). Policy was also instrumental in the establishment of farmers' groups. As such, policy is considered a key constituent of the AKIS of Kirinyaga and the proposed model builds upon the non-system element of national policy from the Comprehensive AKIS / RD model (see **section 4.8**) by adding international policy. National and international policies play a major role in influencing the AKIS, especially in the case of Kenya, whose economy is an agricultural based country. Exports of food and beverage enterprises contributed significantly (39.9% of the total domestic export earnings in 2007 and 42.9% in 2006) to the country's total export earnings (RoK. KNBS 2008a:130). The decisions that the international markets make such as what commodity they would like to buy, what quantities and at what price would thus influence the enterprises produced and the types of information and knowledge that users seek. The intention of this model is to describe the AKIS present in Kirinyaga district at the present time and situation. As reiterated by several authors (Ramirez 1997; Röling 2004), the structure of an AKIS is dynamic and location specific. Testing of the model was beyond the scope of the present study but an area for further studies would be to test the model in Kirinyaga district.

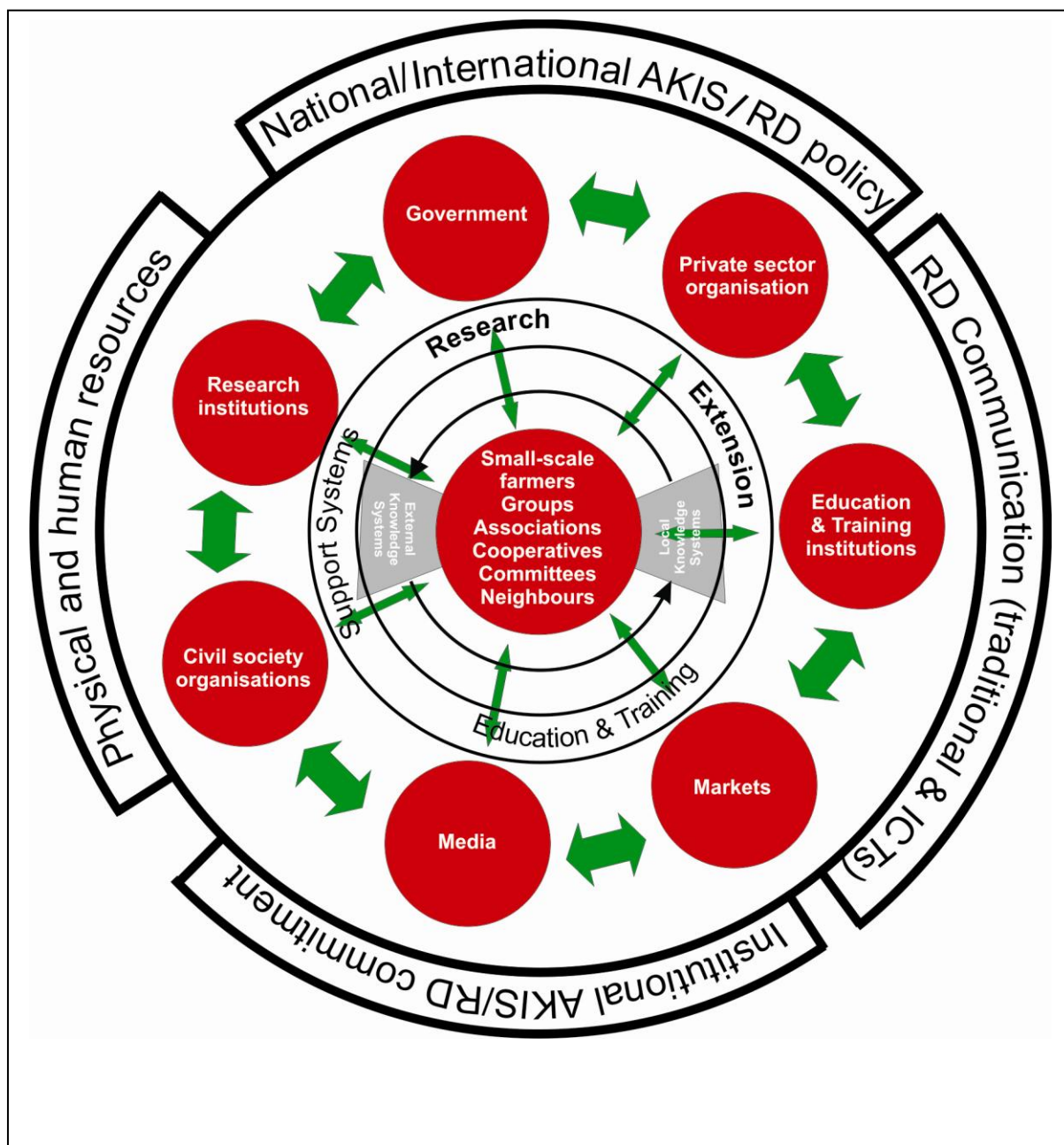


Figure 61: Proposed flexible AKIS model for small-scale farmers in Kirinyaga district

## **CHAPTER THIRTEEN: SUMMARY OF FINDINGS, CONCLUSIONS AND RECOMMENDATIONS**

### **13.0 Introduction**

Chapter thirteen synthesises the research on the agricultural knowledge and information systems among small-scale farmers in Kirinyaga district, Kenya, as presented in Chapters six to twelve. It provides an overview of the research questions underpinning the research problem and the key findings alongside earlier studies. This Chapter summarises the key findings of the present study and highlights convergences and divergences with previous studies. Chapter thirteen presents the major conclusions, evaluates the methodology adopted and highlights the limitations of the study. Further, the final Chapter presents the recommendations of the study and brings to light the originality of the study and contribution to the existing body of knowledge, to policy and practice, and suggests areas for further research.

### **13.1 The purpose of the study, research questions and summary of key findings**

The need to increase production, improve the poor linkages between agricultural actors, improve access to market information and agroprocessing, and address the limited supply of agricultural information and knowledge for farmers highlighted the need to understand the AKISs of small-scale farmers. As stated in **section 1.3**, the purpose of the study was to understand small-scale farmers as key actors in supporting agricultural development and linkages between key actors (especially farmers' groups), their information behaviour, sources of information and knowledge, linkages and flows of knowledge and information (including the role of ICTs), usage of these resources and barriers to accessing knowledge and information. The study also aimed to investigate the existing knowledge management and information management practices and to suggest an AKIS model for small-scale farmers in Kirinyaga district.

### **13.2 Summary of key findings**

This section summarises key findings under socio-demographic characteristics of small-scale farmers and the respective objectives and the research questions that were outlined in **section 1.4**).

#### **13.2.1 Summary of findings on the socio-demographic characteristics of small-scale farmers**

- Small-scale farmers comprised farmers' groups, farmers belonging to a group and farmers not belonging to a group.
- There were slightly more females than males in Kirinyaga district, but the informants of the study had a male: female ratio of 3:2.



- Farmers were between 18 and 95 years old, but the majority fell in the age category of 26-50 years. Very few farmers were 18-25 years old (youth category).
- Most households in Kirinyaga district were male-headed.
- Most farmers were well educated compared to the rural population in Kenya. More male than female farmers had attained higher levels of education (post secondary), and slightly more female than male farmers could not read or write.
- More farmers belonging than not belonging to a group had primary and secondary school education level.

### **13.2.2 Summary of findings on objective one: Information behaviour of small-scale farmers**

This section summarises the key findings on the information needs of small-scale farmers and answers three research questions on information needs of farmers, information seeking behaviour and the farmers' groups that were in place in Kirinyaga district and their roles in facilitating the exchange and sharing of knowledge and information.

#### **13.2.2.1 Summary of the agricultural information needs of small-scale farmers (men, women, youth)**

- Farmers needed information and knowledge on a wide range of areas on the entire market value chain from production to consumption. In addition, farmers needed information on sources of agricultural credit, breeding, soil sampling and fertility and weather.
- Farmers had broader information needs for their main enterprise ranked priority number one than for subsequent enterprises.
- Women carried out more farming activities than men did, but more male than female farmers needed and sought information on a broader range of topics.
- There was a gap between the information available in the present AKIS and the information farmers needed with respect to new technologies or improved farming methods they would like to introduce or improve but did not have information about.
- There were slight variations in the information needs of farmers belonging and not belonging to a group.
- Mixed groups demonstrated the broadest range of needs, followed by female only, male only and youth only groups.
- Farmers did not have sufficient information to meet their needs because information providers were not available, they did not know where to get the information, and some had not sought the information. Other reasons given were inadequate financial resources, the information was not available, communication barriers and language barriers.



#### **13.2.2.2 Summary of information seeking behaviour of small-scale farmers (men, women, youth)**

- Information for the main enterprises of farmers' groups was mainly sought by group leaders through visiting, telephoning or inviting information providers to conduct training or demonstrations.
- Most farmers belonging to a group sought information for their main enterprises from extension, the private sector and neighbours, friends and relatives, while most farmers not belonging to a group obtained information from extension, followed by neighbours, friends and relatives, then the private sector.
- Farmers sought information from more sources for the enterprises ranked priority number one than for subsequent enterprises.
- More farmers belonging than not belonging to a group had made an effort to get information, training or advice.
- Most of the groups that had tried to get information from various sources were mixed groups, followed by female only, male only and then youth only.
- Farmers' groups were relatively more satisfied with information they obtained from providers than individual farmers,
- Slightly more farmers' groups than individual farmers had the capital outlay to implement their ideas.
- Most farmers' groups did not share information and knowledge assets beyond their group because they perceived the information assets of the group to be private goods, others had an attitude of indifference, while some viewed the information as power to give them a competitive edge over competitors.
- More farmers not belonging than belonging to a group shared information that they accessed with neighbours, family and friends.
- More than half the farmers shared local knowledge with neighbours, other farmers and other actors who asked.
- Farmers' groups shared information and knowledge with group members orally through group meetings, training, demonstrations, barazas, cellular phones, print materials, field days and churches.
- Groups that shared information with community members used oral interpersonal communication, demonstrations, field visits, training, exhibitions and farm visits.
- Individual farmers shared local knowledge orally by word of mouth and stories, through print materials.
- Two fifths of the farmers merged external information and local knowledge in order to reduce production costs, improve production and yields, improve effectiveness, experiment and learn, manage risk, conserve the environment and ensure sustainability.

- More farmers not belonging to a group than farmers' groups and farmers belonging to a group merged external information and local knowledge.
- The main challenges in mixing the two knowledge systems included non-availability of information and knowledge on how to mix, low awareness on where to source raw materials on local knowledge methods, cultural barriers and the high cost of mixing.
- Farmers experienced mixed feelings and emotions regarding the outcomes of mixing the two knowledge systems. Some were comfortable about mixing and considered mixing to be useful, felt happy, motivated and eager to see results, while others were unhappy, and felt confused and uncertain.

### **13.2.2.3 Summary of farmers' groups in place in Kirinyaga district, their characteristics and the roles they play in facilitating the exchange and sharing of knowledge and information**

- There were four different types of groups in Kirinyaga district. Most were mixed groups, followed by female only, male only and youth only. While most of the groups had the status of farmers' groups, a few were cooperatives. Most groups were formal and were registered with the Ministry of Gender, Children and Social Services or the Registrar of Societies.
- The main objectives of farmers' groups differed from those of individual farmers. The main objectives of groups were to generate income, improve agricultural development, address social welfare activities, reduce poverty, improve access to markets and find better prices, conserve soil, water and the environment, create employment and access agricultural services.
- There was an exponential growth in number of farmers' groups established from the late 1990s. Some groups were a few months old while one was 41 years old.
- Cooperatives had memberships ranging from 16 to 300 with a mean of 138, while farmers' groups had group sizes of 12 to 138 members with a mean of 29.
- Group activities were funded through contributions by members, from "merry-go-rounds," from proceeds from sale of farm produce and development partners' support.
- Culture, religion and gender played a key role in groups, and men and women carried out different roles and activities in the community.
- Most chairpersons and secretaries of groups were male farmers, while more female farmers held the position of treasurer.
- Kirinyaga district produced more than 56 enterprises comprising cash and subsistence crops. The main criteria for ranking enterprises included the amount of income or profit generated the availability of markets and marketing information, provision of food and food security and the speed of maturity. Most groups produced high value cash crops and marketed the fresh produce while a few groups added value to the enterprises produced.

- Farmers' groups played a key role in the community and carried out various farm activities including husbandry, processing and marketing, and non-farm activities including capacity building, business management and involvement in social activities.
- Farmers' groups provided a platform for face-to-face interactions, which facilitated learning, experimentation and innovation, sharing and exchanging of information, problems and opportunities with group members, other groups and community members who asked. Groups provided an entry point to accessing services such as extension, information and knowledge, credit and funding, inputs at lower prices through economies of scale as well as to markets and better prices. Through interactions, members inculcated a culture of positive competition or motivation to improve farming, increase understanding and knowledge, adopt new technologies and improved linkages with other actors.

### **13.2.3 Summary of findings on objective two: Sources of agricultural information and knowledge**

Objective two was tackled by answering three research questions on sources of information and knowledge, users of the agricultural knowledge and information and the AKISs and features of the system.

#### **13.2.3.1 Summary of where farmers obtained agriculture-related information and knowledge from**

- There were more than 48 sources of information and knowledge in the categories of producers, neighbours, public sector, the private sector, CSOs, international organisations and development partners.
- Extension was the key source of information and knowledge on farming in general for farmers' groups and farmers belonging to a group, followed by the private sector, neighbours, and media, while farmers not belonging to a group cited extension, neighbours, relatives and friends, the private sector and media.
- Farmers' groups mainly obtained information on news about a new technology or farming system from extension, media and the private sector, neighbours, other farmers and friends, groups and group members, barazas, books and field days.
- Farmers' groups mainly found information for a farming question from the group, extension, neighbours or other farmers or friends, media, the private sector, rural experts and elders, research institutions, other farmers' groups and CSOs.
- The main sources of information of farmers' groups for the enterprise ranked priority number one were extension, the private sector, neighbours, research, media and CSOs. A broader range of sources was used for the enterprise ranked priority number one than for number two.

- Farmers belonging to a group mainly used the private sector, extension, neighbours and other farmers, while extension was the top source for farmers not belonging to a group, followed by neighbours and the private sector.
- Farmers' groups were perceived to be knowledgeable, convenient and available and were a key source of information for group members. The information shared by groups was perceived to be of good quality and current. Only a few farmers not belonging to a group obtained information from farmers' groups.
- Male only groups mainly obtained advice, information and knowledge from the private sector, neighbours and extension; female only groups from extension, neighbours and media; and youth only and mixed groups from extension, the private sector and neighbours.
- There were variations in the four divisions on the main sources of information and knowledge used by farmers. The key sources in each division were Central - extension, neighbours and media; Gichugu - extension, the private sector, neighbours and media; Mwea - private sector, extension and neighbours and research, and Ndia - extension, the private sector, and neighbours and research.
- The main market and marketing information sources were local markets, followed by neighbours, intermediaries, media and extension. Some sources specialised in specific enterprises such as cooperatives and societies, farmers' groups, KTDA, horticultural exporting companies, DGAK, rice mills, and milk processing companies.
- Male and female farmers used similar sources of market information but very few females used cooperatives and factories.
- There was very low usage of ICT-based market and other information systems such as KACE, Foodnet and NAFIS.

#### **13.2.3.2 Summary of users of the agricultural knowledge and information of the information providers**

- The main users of the information and knowledge of information providers included producers who were classified under farmers' groups; committees; associations; extensionists; researchers and research institutions; the private sector; training and education institutions; schools; CSOs; policy makers and planners; development partners and visitors.

#### **13.2.3.3 Summary of the AKISs of small-scale farmers in Kirinyaga district**

- The AKIS of small-scale farmers in Kirinyaga had several sub-systems namely small-scale farmers, input suppliers, research, extension, training and education, credit and marketing, which were complementary and contributed to the whole agricultural and information system. There were different AKISs, which were location specific and depended on the agroecological conditions, enterprises produced and the actors on the ground.

- The AKIS of Mwea division in the lowlands areas where rice, cotton and horticultural crops are produced contrasted sharply with those of the highland areas of Gichugu, Central and Ndia divisions. There were variations of the AKISs even within a division in different locations and sub-locations.
- There were limited platforms or “theatres of innovation” that provided opportunities to actors within sub-systems to collaborate and work jointly in addressing specific problems.

#### **13.2.4 Summary of findings on objective three: Linkages and flows of knowledge and information between actors and channels of communication**

This section provides summaries of findings on six research questions focusing on the primary stakeholders, linkage mechanisms between actors and the types of linkages, flows of information, communication channels used, ICT preferences for accessing agricultural information and knowledge.

##### **13.2.4.1 Summary of the primary actors**

- There were more than 150 primary actors in Kirinyaga district who included individuals, groups, institutions and networks, grouped under producers, public, private, civil society, education and training, as well as research, development partner actors, credit and microfinance institutions, local, national and international market and the media.
- There were more than 10 categories of small-scale farmers or producers in Kirinyaga district. The public sector actors comprised government ministries, parastatals, public universities, colleges, training institutions and schools. There were national and international research institutions; more than 40 private sector actors; 22 CSOs and development partners (donors). In addition, there were 11 credit and microfinance institutions who worked with farmers; several, local markets, national and international markets; more than 10 media actors; networks and formal and informal social networks; and a few libraries and information resource centres.

##### **13.2.4.2 Summary of linkage mechanisms and the types of linkages between actors**

- There were horizontal and a few vertical linkages between actors and linkages were generally weak. Most actors linked directly to farmers. The linkage mechanisms included the stakeholder forum, partnerships between actors, training, meetings, demonstrations, exhibitions, visits and tours, agricultural shows, open days and field days.
- Five types of linkages provided a mechanism for linking farmers to different actors in the AKIS based on activity or service offered including information and knowledge seeking linkages; extension and training linkages, service linkages, market linkages, and basic and spiritual needs linkages. Farmers’ groups provided a unique linkage mechanism to various service providers.

- The quality of linkages with different actors varied from sub-location to sub-location, and farmers perceived some actors to be more important than others in providing knowledge and information. The more influential actors or prime movers provided leadership in the production of specific enterprises in different geographic locations.

#### **13.2.4.3 Summary of flows of information and knowledge between key actors (social ecology of groups)**

- Information and knowledge under the public extension services flowed two-ways. Information flowed downstream from the district headquarters to divisional heads, FEOs to farmers, and upstream from farmers through the FEOs to the divisional heads, who fed the information up to the district officers.
- At district level, information flowed through the Kirinyaga district stakeholder forum, which facilitated vertical flow of information between actors, farmers' groups, committees, associations, CIGs, FADC, WUA, farmers' groups as well as through social and community networks to farmers.
- In the community, information flowed horizontally from farmer-to-farmer, from elders to the younger generation. Farmers' groups provided a unique path for the flow of information.
- There were various formal and informal groupings such as CIGs, farmers' groups and "Community parliaments"; committees; associations; the stakeholder forum and through the web of social and community networks such as religious congregations and social welfare groups through which agricultural information and knowledge flowed.

#### **13.2.4.4 Summary of communication channels used by actors (men, women, youth)**

- Farmers mainly used oral traditional and a few modern communication channels for accessing and sharing agricultural information and knowledge.
- Farmers' groups mainly used meetings, radio and demonstrations, while farmers belonging to a group mainly used meetings, neighbours and radio, and farmers not belonging to a group used radio, neighbours and cellular phones.
- More farmers not belonging to a group than belonging to a group used cellular phones.
- There was little use of print media and other than the radio and there was little use of modern ICT channels.
- More male than female farmers attended meetings, listened to the radio, watched TV, video, and used the telephone.
- Meetings, radio, demonstrations and exchange visits were the most effective communication channels used by small-scale farmers for accessing and sharing information and knowledge.
- More than a half the farmers were highly experienced and experienced with communication methods used, but significant percentages had between very little and average experience.

#### **13.2.4.5 Summary of ICT preferences of actors**

- The findings of the study showed that radio and cellular phones were the principle ICTs used for accessing agricultural information and knowledge. Radio, TV and cellular phones were the top three ICTs preferred by farmers' groups, while the order of preference for individual farmers was radio, cellular phones then TV.
- More farmers belonging than not belonging to a group used modern ICTs but more farmers not belonging than belonging to a group used the cellular phone.
- More male than female farmers used ICTs for accessing and sharing agricultural information.
- Farmers preferred radio, cellular phones and TV because: i) radio was easily available, versatile, had a wide reach and coverage, used oral communication and local language, and disseminated current and general agricultural information and knowledge; ii) cellular phones were pervasive and facilitated communication, ensured speedy delivery of information and knowledge and facilitated access to market and price information; and iii) TV combined audio messages and images, which enhanced learning and understanding.
- Farmers perceived a positive impact from ICTs use on their farming activities, which had led to increased adoption of new technologies, improved access and speed of accessing information, facilitated learning and understanding, finding good markets and prices, savings on communication costs and improved communication.
- The main barriers and constraints associated with the use of ICTs included poor telecommunication infrastructure, poor rural electricity infrastructure, lack of ICT equipment, inadequate ICT skills, inappropriate broadcasting times, inappropriate content and length of programmes and language barriers.

#### **13.2.5 Summary of findings on objective four: Assess the usage of knowledge and information**

Objective four answered nine research questions on the types of information and knowledge obtained by farmers; how farmers make decisions that dealt with risk; use of knowledge and information in decision making or innovation or understanding or problem solving; satisfaction of outcome; individual versus group decision making processes; sufficiency of information and knowledge in the AKIS and if not sufficient how farmers went about seeking external information; and barriers and constraints in accessing information and knowledge.

##### **13.2.5.1 Summary of the types of information and knowledge farmers obtain from major sources**

- Small-scale farmers mainly obtained operational information from major sources, followed by technical, awareness and marketing information.
- The main types of information obtained by farmers' groups by broad agricultural themes included plant husbandry, animal husbandry, marketing and price information, fertiliser use and

application, pests and diseases, seeds and seedling varieties, value addition, tree and fruit tree nurseries, agrochemical use and animal feeds for the enterprises ranked priority number one to five. The findings showed that farmers obtained more types of information from the major sources they used than from their farmers' group.

- Farmers obtained different types of information from specific sources of information, for example individual farmers mainly obtained operational, (followed by technical, awareness then marketing) information from extension and neighbours, while they mainly obtained technical, (followed by operational, awareness then marketing) information from the private sector sources.
- The frequency of use of information was dependent on the type of information and the purpose for which information was needed, the convenience of the source for farmers and accessibility of the source.
- Most farmers' groups and farmers belonging to a group obtained information on a monthly basis, followed by twice a month while farmers not belonging to a group were more irregular.
- The Knowledge network analysis table of use based on the value and use of information highlighted gaps in information and knowledge systems and farmers in the different divisions used diverse sources at varying frequencies.
- There was uniformity on extension, which was perceived to be as an important and strong source providing operational, technical and policy information, but average on strategic and weak on market information. However, there were variations in the four divisions on the types of information and frequency of use from private sector actors and neighbours.
- The Knowledge network diagram on use of information based on how the information was applied highlighted farmers' groups as important sources for opinion formation, identification of needs and for implementing a solution in Mwea and Ndia division.

#### **13.2.5.2 Summary of how farmers make decisions that deal specifically with risk**

- Farmers made many complex farming decisions that dealt with risk such as the introduction of new enterprises. Before deciding on a common enterprise for the group, most farmers belonging to a group were in difficult situations, some needed to earn a living, others did not have adequate skills, knowledge and information, some relied on markets for food, and others did not have adequate production resources. The main criterion considered in choosing the group's enterprise was the income likely to be generated.
- The groups first identified alternative enterprises to produce, sought additional information and knowledge on the various questions they had, and then chose the best alternative based on expected benefits, the available resources and constraints.
- In deciding on what enterprise to produce, farmers posed many questions and experienced confusion, different feelings and emotions. Most farmers expressed feelings of happiness with the



decision they made about agricultural enterprises and the returns they obtained, while a few were disappointed and experienced feelings of confusion, despair, uncertainty and disillusionment.

#### **13.2.5.3 Summary of knowledge and information that helped make the decision(s) or innovation or gain understanding or solve a problem**

- Farmers used information pertaining to the suitability of the area for a particular enterprise; economic factors such as the income likely to be generated; production resource factors such as the availability of capital, land, labour and information and knowledge; social factors such as poverty reduction, improved livelihoods; human capital factors such as skills; and market factors such as prices and the reliability of exporters to guide decision making.
- Farmers used different types of information and knowledge from multiple sources to inform the decision(s), or to solve the problem, or inform the innovation, or to improve understanding. Farmers belonging to a group had more skills, and better access to knowledge or information on farming than farmers not belonging to a group did (see **sections 9.3 and 9.4.1**).
- Farmers used information that responded to the specific needs spelt out in the questions posed in **sections 10.3.1 and 10.3.5** such as on new technologies, good agricultural practices, diversification of enterprises, farming as a business, markets and prices.

#### **13.2.5.4 Summary of satisfaction / non satisfaction with the decision(s) or innovation or solution and why or why not**

- Most farmers were satisfied with the decision or innovation, or understanding gained or problem solved and perceived that they had realised increased yields, income, improved livelihoods, improved understanding, and sufficient food for their household.
- Farmers who were not satisfied cited challenges of financial constraints, availability of the information that they needed, they did not know where to find the information, experienced confusion or uncertainty about what to produce, had disagreements among group members or household units on what to produce, had leadership problems and poor markets and prices.

#### **13.2.5.5 Summary of group versus individual decision making**

- All group members participated in decision making, with the exception of a few, where the executive committee or chairperson made decisions on behalf of the groups. Decisions made were mainly shared with members at group meetings, through word of mouth (door-to-door), minutes and letters to members or notice boards.
- Group decision making took a longer time, required consensus of members and was based on the collective knowledge and information assets and resources of group members, and was perceived to be richer, more exhaustive, well researched and analysed and more reliable and less risky than individual decision making. However, group decision making was perceived to be more rigid,

stressful, and risky and some experienced conflicts because of the vested interests of different members. Most farmers belonging to a group preferred group decision making to individual decision making.

- Individual decision making was perceived to be easier and faster because it was based on what one person or household knew, thought, preferred or their capability in terms of resources. It was more flexible and focused on a narrow range of personal or household interests. There were no conflicts and the decision making process was not as stressful as group decision making. However, some farmers considered individual decision making shallow, lacking in depth and risky because of the narrow knowledge base of an individual as opposed to a group.

#### **13.2.5.6 Summary of sufficiency of knowledge and information in the AKIS**

- More than half the farmers perceived the information and knowledge available in the AKIS insufficient for addressing the farmers' needs.
- Farmers sought external information through social networks, visits to other farmers, attending demonstrations, training and tours outside the district and through self-experimentation.
- Farmers suggested the need for more information and knowledge through the provision of more training, learning opportunities, demonstrations, field days, exchange visits, and more service providers.

#### **13.2.5.7 Summary of barriers and constraints small-scale farmers face in accessing agricultural knowledge and information**

- The main barriers and constraints in accessing and sharing external information and knowledge were limited availability of information providers; poor access to quality information ; high cost of information services; inadequate information resources; limited learning opportunities; high interest rates on agricultural loans and credit; personal, social and cultural barriers; communication barriers and illiteracy; poor coordination and collaboration between actors; weak linkages between actors; conflicting objectives and priorities by the different actors; mistrust among actors; inadequate time and inappropriate policies.
- The main barriers and constraints encountered by farmers in accessing and sharing local knowledge included insufficient sources of local knowledge in the community; lack of awareness on the “knowers” in the community; ignorance; low opinion of local knowledge; personal, social and cultural barriers; poor sharing culture; the lack of platforms for sharing and the tacit nature of knowledge.

### **13.2.6 Summary of findings on objective five: Determine the current practices in managing local knowledge and external information among farmers**

This section presents summaries of findings in relation to two research questions on information management and knowledge management practices in Kirinyaga district.

#### **13.2.6.1 Summary of external information management practices**

- Most of the current practices of managing external agricultural information were traditional, and information was mainly collected orally from information providers and through training, seminars, exhibitions, shows, field days, barazas, demonstrations, visits and print format. Most groups processed external information from oral sources through minutes recorded by the secretary and notes taken by individuals. Print materials were collected from various sources in the form of books, manuals, brochures, newsletters and handouts. The information resources including the records book, minutes file, and print materials were stored by the secretary or the chairperson and in people's heads.
- Most individual farmers captured external information in personal notebooks. Information was disseminated orally through informal discussions with other farmers and neighbours, group meetings, training, barazas and through accessing the resources collected and stored by group officials. The information collected, processed and stored was used to improve agricultural production, to increase yields, train other groups and community members, to establish new enterprises and farming techniques. Individual farmers captured the useful information they obtained from training and meetings in their personal notebooks, which they stored at home along with other print resources they collected or purchased for future consultation.
- Some CSOs, training and education institutions, research institutions and government departments in Kirinyaga district and in Nairobi collected, processed and stored different types of materials mainly for use by the staff. The Ministry of Agriculture maintained the "Information desk," comprising information resources collected from various actors through exchanges, gifts, donations and purchases. The collection was processed manually and was stored in a cupboard at the district headquarters in Kerugoya, which was open to the public. The AIRC repackaged agricultural information for farmers and extension officers in print and electronic formats in form of videos, radio programmes and TV documentaries.

#### **13.2.6.2 Summary of local knowledge management practices**

- Farmers captured local knowledge from elders, parents, group members or neighbours orally, recorded, and stored it in people's heads, personal notebooks and group minutes. The knowledge was shared among group members through group meetings and CoPs, and with neighbours, family members, relatives and other community members through oral discussions. The knowledge shared was used to improve farming activities, to reduce production costs, to conserve

the environment, to preserve knowledge for future generations, and to facilitate learning and sharing of knowledge.

- CSOs captured knowledge from farmers through interactions on the farm. KENFAP and other actors in Nairobi such as KENRIK and KARI captured knowledge from exhibitions, shows, surveys and publications orally through interviews, through observation, participatory appraisals, audio tapes and videos and recorded it in audio tape format, radio, print (brochures, books, newsletters), documentaries, videos, CD-ROMs and databases. The knowledge recorded was shared through workshops, training, expert discussions, newsletters, brochures, videos, visitors to their offices, demonstrations and books and through the resource centers established in Nairobi. Farmers and intermediaries used the knowledge to improve farming activities, reduce production costs, conserve the environment and to improve human health.

### **13.3 Conclusions**

This section presents conclusions based on empirical findings of the present study, observations, key lessons learned while undertaking the study and comparisons, contrasts and alternative explanations based on findings of other authors, as well as strengths, weaknesses and limitations of the study. For convenience, the conclusions are presented under each of the study areas even when they cut across more than one such area.

#### **13.3.1 Conclusions on the socio-demographic characteristics of small-scale farmers**

- Kirinyaga district is characterised by a high population, small land sizes, forest destruction and fuelwood shortage. Considering their negative impacts of climate, the agricultural sector, farmers need to be encouraged, motivated and facilitated, to engage in sustainable NRM activities to preserve and protect the environment through appropriate soil and water conservation and reforestation for the benefit of the wider community. Planting trees would conserve the environment, provide wood fuel and contribute towards “green miles” to help mitigate the effects of global warming and climate change.
- This study showed that there were very few youthful (18-25 years old) farmers practicing farming. This implies that there is a threat to farming as an occupation and to agricultural production and productivity. The low farming activity by the youth is partially explained by the poverty associated with most small-scale farmers trying to eke a living from small pieces of land. Most youth has thus tended to associate farming with poverty, and perceived farming to be unappealing and an alternative of the last resort. Most youth thus migrated to towns in search of off-farm options. It is thus concluded that the image of success or failure in the community helped to shape the choices made by the youth in venturing into farming activities. As explained by Chan and Elder (2001:38-39) the success of parents in farming helped to shape the choices made by the youth.

- Most farmers were fairly well educated, with most female farmers having attained primary education level while most male farmers had secondary school education. Overall, male farmers were more educated than female farmers were.
- This study showed that most farmers' groups focused on productivity, social, economic (income generation) and environmental welfare of the community. The present study showed that the primary objective of farmers' groups was to generate income. Agricultural actors, including service and input providers, working with farmers thus need to factor in the objectives of farmers' groups and individual farmers to capture their interest and improve adoption of new technologies.
- The findings of the present study confirmed that culture, gender and religious viewpoints played an important role in the farming activities and practices of farmers in Kirinyaga district. The different roles carried out by men and women, and the few female positions in leadership highlighted the importance of mixed groups, and the need to include men, women and youth in group leadership to ensure their participation in agricultural development. Men held most power in groups and the participation of women at decision making level was abysmal (see **section 6.4.5**). The farmers' groups brought to light the power structures that were prevalent at household and community level (Gotschi, Njuki and Delve (2009:276). According to Gotschi, Njuki and Delve (2009), women who joined mixed groups benefitted more from the social capital in groups and improved access to information, services and contacts compared to those in female only groups.
- However, the present study showed that more female than male farmers held the position of treasurer because women were perceived to be more trustworthy with money than men were (see **section 6.4.5**).
- Small-scale farmers produced more than 56 cash and subsistence enterprises because of the wide and varied agro-ecological and climatic conditions in Kirinyaga district.

### **13.3.2 Conclusions on the information behaviour of small-scale farmers**

This section presents the main conclusions based on the key findings on the information behaviour of small-scale farmers. The section answers three research questions on information needs of farmers, information seeking behaviour, farmers and farmers' groups that were in place in Kirinyaga district and their roles in facilitating the exchange and sharing of knowledge and information.

#### **13.3.2.1 Conclusions on the agricultural information needs of small-scale farmers (men, women, youth)**

- The diversification strategy adopted by different households and some farmers' groups led to diverse and multidisciplinary information needs that cut across the production to consumption continuum and across disciplines. The diverse needs pointed to the need for availing the farmers and their groups of a broad range of development information to address their agricultural and

non-agricultural information needs on areas such as meteorology, health, education and tourism. Although the needs of farmers were generalised under groups and individual farmers, needs depended on the specific needs of an individual and their circumstances, and were location specific and group specific.

- The needs of farmers were dynamic and depended on the enterprise(s) adopted and the purpose(s) for which the information was needed. Farmers needed information on the entire market value chain from production to consumption for the main agricultural enterprise(s). All categories of farmers had a broader range of needs for the enterprise ranked priority number one than subsequent enterprises because most groups shared a common interest on the key enterprise of the group, while individual farmers put more emphasis on their primary enterprise.
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- From the available evidence, it was concluded that there were slight gender variations in information needs. In addition, despite the fact that male and female farmers expressed needs on similar topics for information on new technologies or production systems; there were variations in the order of priority of topics and more male than female farmers expressed needs on most topics. It was also observed that more male than female farmers sought information from most sources but more female than male farmers sought information from farmers' groups and other group members.
- This study showed differences in the order of priority of topics that male and female farmers needed. More male than female farmers needed information on most topics on the production to consumption continuum. Based on these findings, it is concluded that there were slight gender variations in the information needs of farmers. In contrast, Garforth's (2001a) study in Eritrea showed marked differences in topics needed by men and women.
- Farmers' groups had the widest range of needs, followed by farmers belonging to a group, then farmers not belonging to a group. It is thus concluded that membership of groups increased the propensity to seek for information, and farmers' groups, and, in particular, mixed groups motivated farmers to seek information. Mixed groups were more diverse and dynamic and expressed the broadest range of needs compared to female only, male only and youth only groups. Youth only groups worked on limited enterprises hence had the narrowest range of needs.
- There was a high percentage among all categories of farmers seeking for additional information, training or advice on technologies and farming methods that they would like to introduce but did

not have sufficient information about. The study clearly highlighted conspicuous disparities between the available information and the information farmers needed, depicting information gaps.

- Farmers in Kirinyaga district considered farming a risky business and hence constantly needed new information to make informed decisions on alternative enterprises, technologies or farming methods. The present study showed that farmers' needs were dynamic and although farmers received information and knowledge for the enterprises they were producing, they needed additional information on new areas of interest or fallback positions.
- Farmers needed information for various reasons including to increase production, income and profits, for decision making, to reduce poverty, increase employment and improve markets and prices. Farmers also needed information because it was a key production factor. However, limited availability of resource persons, low awareness of where to find information, insufficient information, time constraints, ignorance and inadequate financial resources to access information deprived them of information when they needed it.

#### **13.3.2.2 Conclusions on information seeking behaviour of small-scale farmers (men, women, youth)**

- The information seeking behaviour of farmers depended on the geographical location and the enterprise for which information was being sought as well as the actors on the ground, but overall, most farmers sought information from extension services. Most farmers' groups and farmers belonging to a group sought information for the main enterprise ranked priority number one from extension, followed by the private sector and neighbours while farmers not belonging to a group sought information from extension, followed by neighbours then the private sector. Based on these findings, it is concluded that neighbours, relatives and friends were a key source of information. Farmers preferred local sources that were convenient and accessible.
- Most farmers' groups engaged in the production of one enterprise, hence interacted, learned and invested more on their first priority enterprise. Farmers learned through interactions and the influence of other farmers, through practice and observation, as well as the human factors that motivated members to seek information.
- Information seeking behaviour was gender differentiated. As although men and women sought information from similar sources, proportionally more men than women sought information from most sources, but more female than male farmers sought information from farmers' groups and other group members. This study also showed that more female than male farmers sought information from rural experts, elders and parents.
- Mixed groups were more proactive in seeking information than female only, male only and youth only groups. Farmers' groups influenced group members, and farmers belonging to a group were more likely to look for agricultural information than farmers not belonging to a group were. As

indicated by the findings on the proportionally more farmers belonging than not belonging to a group who had made an effort to get information, training and advice. The collective learning, observation and innovation in groups influenced information seeking behaviour.

- Most farmers' groups had a poor information sharing culture beyond their group because they perceived the knowledge assets of the group to be private goods for the benefit of group members. However, individual farmers belonging to a group were more predisposed to sharing than groups. On the other hand, more farmers not belonging than belonging to a group perceived information to be a public good and shared their knowledge and information with other community members.
- There were no formal channels or networks for sharing local knowledge and providers of local knowledge were limited. Most knowledge was shared orally with family members, group members through meetings and informal discussions, training, demonstrations, visits, barazas. External agricultural information was as important as local knowledge and farmers combined the two knowledge systems for synergy, to improve production and yields, reduce production costs, improve effectiveness and efficiency, reduce risks, ensure food security, conserve the environment and biodiversity, to ensure sustainability of farming and to learn and experiment. Others merged knowledge systems to add value to local knowledge (Lwoga and Ngulube 2008).
- External agricultural information was mainly shared through oral communication channels during group meetings, training, demonstrations, informal discussions and barazas. The sharing of external information was often done alongside local knowledge systems that were based on the culture of the community.
- There were no formal channels or networks for sharing local knowledge and providers of local knowledge were limited. Most knowledge was shared orally with family members, group members through meetings and informal discussions, training, demonstrations, visits, barazas.
- Sharing of knowledge among farmers was mutual and those who received reciprocated by sharing what they knew, hence by sharing what they knew, farmers in return learned what others new. Local knowledge was shared along social and cultural lines. The present study observed the culture of not sharing external information and local knowledge, which jeopardised the flows of information, knowledge and learning, and caused information asymmetries. Some farmers' groups and farmers regarded their knowledge assets as a source of power, which affected their propensity to share because they did not wish to weaken their positions. However, the non-sharing culture at times enhanced success by providing intelligence and a competitive edge over competitors (Evgeniou and Cartwright 2005:297).

### **13.3.2.3 Conclusions on farmers' groups in place in Kirinyaga district, their characteristics and the roles they play in facilitating the exchange and sharing of knowledge and information**

- There was strong group activity in Kirinyaga district and most farmers worked collectively and belonged to formal or informal groups. The registered groups were diverse comprising mixed



groups, women only, male only and youth only groups and operated as legal entities that could transact business and negotiate agreements. The groups had the status of farmers' groups and cooperatives. These groups varied in age from a few months old to 41 years.

- There was an exponential growth in number of farmers' groups, which were established from the late 1990s onwards, with most male groups being registered after the year 2000, while the youth only groups were founded after the year 2005 in response to calls by the government, civil society and private sector actors and development partners. The rapid increase in the number of groups and the age of the groups was an indication of the importance and success of groups. The NALEP Programme and the "Njaa Marufuku Kenya" project as well as some private sector and CSO actors catalysed the process of group formation by facilitating the formation of CIGs and FADCs to access services, improve delivery of extension services and alleviate poverty and hunger, access credit and inputs as well as to improve access to agricultural information and knowledge.
- Farmers' groups played a very important role and accelerated the sharing of agricultural information and knowledge. Some farmers belonged to up to three groups, which provided access to diverse services, information and knowledge and when one member learned something new, the information was shared with other members of the group through interaction with members and experts. Groups provided a platform for social interaction and motivating farmers to learn collectively and share information and knowledge through formal and informal activities. This study found that the interrelationships and networking between group members yielded social capital that facilitated learning and innovation. The collective action of farmers' groups motivated individual farmers and the social capital in groups increased their propensity to find information and knowledge, hence addressed the barrier of information asymmetry between group members but not beyond the group.
- The new government policy advocated the delivery of service through groups. This approach was efficient, cost effective and enabled more farmers to benefit from the services offered.

### **13.3.3 Conclusions on the sources of agricultural information and knowledge**

This section gives the main conclusions on the sources of agricultural information and knowledge based on the key findings of the study on where farmers obtain information and knowledge, users of the agricultural knowledge and information of the information providers and the AKISs in the district, as well as the features of the system.

#### **13.3.3.1 Conclusions on where farmers obtained their agriculture-related information and knowledge**

- Farmers obtained agricultural information and knowledge to support their farming activities from diverse sources, and preferred oral "people sources of information." The sources of information

used depended on the purpose for which the information was needed. The main sources of advice, information and knowledge for farming in general differed slightly from those for answering a farming problem and for finding out news about a new technology or market or farming system.

- The key source of information for farming in general, for finding out news and for answering a farming problem was extension, followed by the private sector, and neighbours. The high rating of extension services was partially explained by the wide coverage and penetration of public extension services in rural areas, at division, location and sub-location levels, and the perception that information obtained from extension services was authoritative and comprehensive.
- Farmers' groups used different sources of information for farming in general compared to those used for answering a farming problem and for finding out news about a technology or market or farming method. Extension was the key source of information for all types of groups, except the male only groups, which used private sector sources, followed by neighbours then extension. Female only groups primarily sourced for information from extension officers, followed by neighbours, then the media, while the youth only and mixed groups searched for information from extension, the private sector and neighbours. The differences suggest that farmers needed diverse sources of information to meet their diverse needs.
- Farmers preferred sources represented by service providers that visited them on their farms. The private sector actors such as horticultural exporting companies were perceived to be important because they visited farmers at their farms and provided markets for farmers produce. Some provided training and inputs. Neighbours were considered important sources because of their proximity and their availability. The variations observed in the sources used by different categories of farmers in different geographical divisions were likely to be because of the varied agroecological conditions, the different types of enterprise(s) produced in the different locations and sub-locations, and the different actors who operated in the respective divisions, locations and sub-locations.
- All categories of farmers used similar sources of information and knowledge for the main enterprises ranked priority number one and two but there were variations in the order of importance of sources consulted depending on the choice of enterprise(s) and while some relied on a few key sources, others used a broader range of sources.
- More individual farmers than farmers' groups used more personalised methods such as listening to the radio, watching TV, reading books, magazines, manuals and newsletters, attending shows, conferences and barazas to obtain information.
- This study showed that although research institutions were the key generators of technologies, research was not among the top ten major sources of news about new technologies, farming practices or markets used by farmers. Empirical evidence available showed that most farmers sought information on new practices from extension technical advisors or attending field days.

The present study showed that some farmers learned about new practices from the private sector and the media and farmers' groups. Most group members had benefitted from much training and many visits, hence were a good source of information for news about new technologies or farming systems.

- The present study showed that some community leaders commanded great power in influencing small-scale farmers on new technologies or farming methods.
- The study showed that most information provided by market information providers did not meet their local needs. This study thus concludes that there is a gap in market information in rural areas.
- The main sources of market information depended on the enterprise produced but generally, individual farmers used local markets which provided farmers with local market and price information, neighbours, farmers' groups (for farmers belonging to a group) and cooperatives and associations. Local markets were the chief sources for market information because they provided relevant local content on markets and prices, which other market information systems and sources failed to offer. Specific commodities such as tea obtained market information from KTDA, coffee from factories or societies and cotton from the Mwea ginnery. Market information from the media was important but it did not fully meet the needs of farmers, as it did not provide local content (prices offered at the local markets).
- Market information systems had the potential to open up opportunities for better markets and prices but this inherent capacity had not been harnessed in Kirinyaga district. This study showed that there was very little use of systems such as KACE, Foodnet, MISTOWA and NAFIS. The present study observed that the different market information systems were all stand-alone and offered similar services, leading to duplication of effort.
- Although male and female farmers used similar sources of market information, there were slight variations in the order of importance attributed to sources used by male and female farmers. Very few female farmers used cooperatives, factories and societies linked to the production of cash crops that were perceived to be a male crop for market information.
- Although there were many sources of information and knowledge in Kirinyaga district, there was no systematic effort devoted to providing learning opportunities and agricultural information and knowledge to farmers.
- Farmers' groups found it difficult to access information from key sources, and found it very difficult to access information from other farmers' groups. More farmers belonging than not belonging to a group found it easier to access information from the main sources of information for the enterprise ranked priority number one and perceived the information they obtained from extension services to be reliable, useful, and relevant.

### **13.3.3.2 Conclusions on users of the agricultural knowledge and information of the information providers**

- There were many users of the agricultural information and knowledge provided by different information producers, who were not homogenous and had different needs and expectations. There were different categories of users including individuals, groups, networks and institutions located at different geographic locations and with varied needs.

### **13.3.3.3 Conclusions on the AKISs of small-scale farmers in Kirinyaga district**

- More than 150 different actors were active in the generation and dissemination of agricultural information and knowledge and were classified under different sub-sectors. The finding of the present study showed that the different sub-sectors of the AKIS had different functions in agricultural development that needed to work synergistically and contribute to the whole. It is thus concluded that the success of small-scale farmers was dependent on the interrelationships between key actors of the AKIS.
- Linkages between the many actors with different objectives were weak and uncoordinated, and horizontal and vertical linkages between actors needed to be strengthened and missing linkages established.
- Small-scale farmers and farmers' groups were not merely recipients of information and knowledge but were generators and disseminators of information and knowledge. Farmers' groups were among the key actors that provided a platform for linking actors and for sharing experiences, information and knowledge, as well as for learning and innovation. The findings of the present study on the nine-seeded hole technology confirmed that linkages facilitated innovation and improved learning among the different actors.
- There were variations in the AKISs found in the different divisions, locations and sub-locations of Kirinyaga district, which were complex and depended on the geographic location, agro-ecological and climatic conditions, the enterprises produced and the actors on the ground. The AKISs were heterogeneous, comprising different people, institutions and networks that were peculiar to specific locations and different actors providing agricultural knowledge and information to small-scale farmers. Each of the actors had their own objectives and interests and linking them into a whole was complex. It is thus concluded that there were many different AKISs in a district, which depended on the geographical location, the agro-ecological and climatic conditions, the enterprises produced and the actors on the ground. The variations in the AKISs needed to be understood to facilitate the flow of agricultural knowledge and information and guide information provision to small-scale farmers.
- Improving the AKIS of Kirinyaga district entailed strengthening linkages, networks, partnerships and collaboration between actors and creating awareness about the benefits of working jointly. As underscored by Röling (2004:7), an "AKIS has to do with networks of multiple stakeholders,

with learning and with interaction ... and the way we make sense of the future and of the opportunities that are available.”

### **13.3.4 Conclusions on the linkages and flows of knowledge and information between actors and channels of communication**

This section summarises the key conclusions based on the study findings on the primary stakeholders, linkage mechanisms between actors and the types of linkages, flows of information, communication media used, ICT preferences for accessing agricultural information and knowledge.

#### **13.3.4.1 Conclusions on the primary actors**

- There were many actors comprising individuals, groups, institutions and networks that were classified under ten major categories. These actors were involved in the generation, and dissemination of agricultural knowledge and information to small-scale farmers comprising individuals, groups and institutions and other actors. Each actor played a complementary role in meeting the holistic needs of farmers.
- Small-scale farmers and farmers’ groups were among the key actors in the AKIS of Kirinyaga district and were generators and consumers of information and knowledge as well as experimenters and innovators (see **section 9.1.1**).

#### **13.3.4.2 Conclusions on linkage mechanisms and the types of linkages between actors**

- Linkages between actors occurred through provision of various services and activities linkages such as extension and training linkages, inputs, service linkages and basic and spiritual needs linkages. In addition, training, meetings, demonstrations, barazas and field days, as well as groups, committees, associations, networks and stakeholder forums provided linkage mechanisms between actors.
- The analysis of linkages between actors in the AKIS of small-scale farmers showed the existence of some networks such as the Rungeto leaders’ network and “Community parliaments” and the various groups, which provided space for interactions and sharing of knowledge and information. The experiences of the few networks point to the need to promote networking among actors who shared similar problems such as farmers’ groups to promote learning and innovation. The present study showed that farmers learned best by “doing,” through interactions with intermediaries. Group training had a multiplier effect in that information shared with many farmers trickled down to other group members who did not attend, and other farmers through local social networks.
- The Kirinyaga stakeholder’s forum provided a platform, which facilitated joint planning, coordination and implementation of activities. The forum facilitated linkages to other actors from different sub-systems, which promoted the sharing and exchange of knowledge and

information. However, there were challenges experienced that needed to be addressed to improve the effectiveness of the forum.

- This study showed that although there were many actors, linkages between actors were weak. The importance of actors and quality of relationships between key actors and small-scale farmers differed from sub-location to sub-location and from one enterprise to another. Despite their being overstretched and not available when needed, extension officers emerged a key actor with varying levels of importance to farmers and quality of relationships. The private sector actors were also important but there were challenges with the existing contracts between farmers and horticultural exporting companies. Understanding of the linkages was essential in planning for interventions to improve information flows and AKIS.
- The important actors had different influences in the different enterprise sub-sectors or industries. The Prime mover septagrams showed that different actors were influential under different enterprises in different sub-locations and point to the need for identifying the prime mover actors and strengthening linkages that were weak.

#### **13.3.4.3 Conclusions on flows of information and knowledge between key actors (social ecology of groups)**

- Agricultural information and knowledge flowed two-ways, as well as horizontally and vertically at various levels in the community. Information and knowledge flowed horizontally from elders and parents to farmers and vertically from agricultural actors at district, division, location and sub-location level to farmers and other actors. The linkage matrix diagram showed that there were more horizontal than vertical linkages.
- This study showed that public extension services played a vital role in facilitating the flow of information and knowledge to farmers, and farmers' groups and the AKIS in general facilitated the provision of extension services. However, extension services in Kirinyaga were constrained by the limited resources and the small numbers of extension officers. The resultant gap opened the way for the private sector and civil society extension services. Farmers' groups, associations, committees, "Community parliaments," networks, partnerships and the Kirinyaga stakeholder's forum played a key role in improving the flow of information and knowledge, bringing to light the social ecology approach.

#### **13.3.4.4 Conclusions on communication channels used by actors (men, women, youth)**

- Communication channels are powerful tools for enhancing the flow of information and knowledge, and the most important communication channels used by farmers were oral face-to-face channels. This study found that the main communication methods used by small-scale farmers in accessing and sharing agricultural information were traditional channels that were

largely oral and interpersonal. The key channels used included meetings and barazas, neighbours, radio, exchange visits, demonstrations, study tours, cellular phones and radio.

- Although printed media did not emerge as a key channel in the present study, they played a very important role in disseminating agricultural information and knowledge. Print materials were valued by farmers because they were authoritative (Leach 2001a:55) and played a “critical supportive role” for other actors in disseminating agricultural information (Morris and Stilwell 2001:72-73). The present study observed that the AIRC played a key role in repackaging farmer-targeted materials in print and electronic formats but the resources were not accessible to farmers in Kirinyaga district.
- The findings of the present study showed that mass communication played an important role in disseminating information about new agricultural technologies and farming systems, and radio was among the key communication channels used by small-scale farmers. Based on the findings on oral, print and electronic communication media, it is concluded that these media need to be mixed in designing information and knowledge systems and in strategies for disseminating agricultural information and knowledge to rural communities.
- Barazas were important channels for sharing important information, which facilitated rapid spread of messages through local social networks to other members of the community who did not attend the baraza. Sharing of knowledge or information through such public gatherings ensured inclusion of the different categories of community members.
- The different communication channels used by farmers were useful and effective in sharing agricultural information and knowledge. However, the findings of the study showed that relatively high percentages (40.6% for farmers’ groups, 37.2% for farmers belonging to a group and 28.3% of farmers not belonging to a group) perceived the effectiveness of the key communication channels used as average and below average, and around 40% of farmers’ groups and almost a half (47.1%) of farmers not belonging to a group had average and below average experience in accessing and sharing information with the main communication channels used, it is concluded that the farmers need to be involved in the development of content, and be trained on how to use the different communication channels to improve their effectiveness (see **sections 9.4**).

#### **13.3.4.5 Conclusions on ICT preferences of actors**

- There was low usage of ICTs and especially modern ICTs such as computers and the internet for accessing and sharing agricultural information and knowledge (see **section 9.5**). This finding suggests that the computer may not be the appropriate tool for farmers in rural areas. Farmers preferred to use radio, TV and cellular phones to access and share agricultural information and knowledge. Although cellular phones were pervasive, airtime was perceived to be too expensive. Some farmers were not comfortable using cellular phones to send SMSs (Wirastuti *et al.* 2008:137) because the space for composing the message was limited (Gakuru, Winters and

Stepman 2009:2) or they did not have adequate skills (Ochieng and Waema 2009). Others had low education levels which were inadequate for operating some of the features on the phone such as the SMS service (Okello, Okello and Ofwona-Adera 2010:14-15).

- Most farmers who had used ICTs perceived the tools as very helpful and helpful. The present study showed that ICTs held great potential in improving access to agricultural information and knowledge systems, but there was a need to sensitise and train farmers on the use of new electronic information and knowledge systems, and to combine traditional and modern ICTs. As pointed out by many authors (Mutua-Kombo 2001; Ramírez and Quarry 2004:12; Karamagi Akiiki 2006:76), the ICTs introduced needed to be rooted in the cultural background of the communities being served.
- There were gender variations in the use of ICTs for accessing and sharing information and knowledge. This study showed that more male than female farmers used the different ICTs, leading to social exclusion in gender and ICT usage in rural areas.
- While some farmers experienced feelings of happiness and satisfaction, others felt uncertain in connection with the effectiveness and relevance of ICTs in accessing and sharing agricultural information and knowledge. These feelings affected the lives of farmers and some perceived that ICTs had improved access to markets and price information, saved time and money, as well as improved farming, yields and profits.
- Appropriate modern ICTs such as the cellular phone that was a practical tool for farmers in rural areas holds potential for solving banking and payment problems to farmers or service providers. Most farmers and traders had cellular phones and farmers, service providers, intermediaries and other market actors could use the M-Pesa and Equity Bank electronic money transfer services to pay promptly for goods and services upon exchange of goods or delivery of services.

### **13.3.5 Conclusions on the usage of knowledge and information**

This section gives the main conclusions based on the study findings on the types of information and knowledge obtained by small-scale farmers; how farmers make decisions that deal with risk; use of knowledge and information in decision making or innovation or understanding or problem solving; satisfaction of outcome; individual versus group decision making processes; sufficiency of information and knowledge in the AKIS, and if not sufficient, how farmers go about seeking external information; and barriers and constraints in accessing information and knowledge.

#### **13.3.5.1 Conclusions on the types of information and knowledge farmers obtain from major sources**

- The present study found that agricultural information was indispensable in farming and most farmers used operational information from their main sources. The type of information used was determined by the farming objectives, the enterprise(s) and the purpose for which information or



knowledge was needed and others used technical, strategic, awareness, policy and market information (see **section 10.1**). Other determinants of the type of information used included the type of decisions farmers needed to make or the nature of the problem they needed to address, the value and importance of information, and on the application of information.

- There was low usage of technical, awareness, market, strategic and tactical information that point to gaps in the AKIS. Likewise, findings from the knowledge network analysis table on the types of information used based on value and importance of sources showed gaps in market, strategic, technical and operational information.
- Very few farmers not belonging to a group used information from farmers' groups. They mainly use operational and technical information. The knowledge network analysis table on the types of information used, based on value and importance of the sources, identified gaps in market, strategic, technical, and operational information.
- There were divisional variations in the types of information used from key sources based on the use to which the information obtained was put and the frequency of use. Farmers applied information from multiple sources to the identification of problems or needs that required intervention, for image formation, to help evaluate available options, and for the implementation of solutions depending on the situation and the environment in which they operated.
- Most farmers' groups and individuals belonging to a group used information on a monthly or weekly basis based on when the groups met. However, as already mentioned above, the trend for farmers not belonging to a group was irregular.

#### **13.3.5.2 Conclusions on how farmers make decisions that deal specifically with risk**

- The results on decision making indicated that farmers experienced many uncertainties in making strategic farm management decisions. This study showed that farmers' groups made important decisions such as what enterprises to adopt, alternative enterprises to switch to, management of the enterprises, marketing of agricultural produce, combining resources, and sources of inputs, credit, knowledge and information.
- Farmers' experiences were not homogenous and they experienced different feelings, emotions and wishes in connection with decisions made on the enterprise(s) they produced, and experienced mixed feelings. While some experienced feelings of happiness, satisfaction, and were motivated, others were disappointed, dissatisfied, demoralised, discouraged, confused and uncertain. This study thus concludes that the feelings and emotions of farmers motivated or demotivated them from seeking information. There is thus a need to understand the feelings, emotions and perceptions of farmers and how they view the "worlds" around them in order to improve decision making, problem solving, understanding and innovation.
- The critical factor in deciding on what enterprise to produce was the potential income the enterprise was likely to generate. The decisions made were thus dependent on the available

information and local knowledge, the circumstances of farmers, and the unique knowledge base of farmers. In addition, the farmers integrated external information with their own knowledge and experiences to inform decision making.

- Farmers belonging to a group had better access to information and knowledge to facilitate decision making than farmers not belonging to a group. Decisions based on inadequate information resulted in disappointment, while farmers who based decisions on a sound information base experienced more positive than negative feelings that helped them change individually and collectively respectively.

#### **13.3.5.3 Conclusions on knowledge and information that helped make the decision(s) or innovation or gain understanding or solve a problem**

- The findings of the present study showed that information, knowledge and learning underpinned the decision making, problem solving and innovation processes, and enhanced farmers' understanding of many agricultural aspects. The process of bridging the gap or appropriate decision making required timely and accurate information and knowledge.
- More farmers belonging to a group had constructed bridges over the gap between their prior situations and the desired outcome by using information because they had more access to information than farmers not belonging to a group had. Farmers used different types of information for different purposes and each piece of information contributed to bridging the gap. As pointed out by Llewellyn (2007:149), each type of information used had its own economic value.
- This study showed that the key bridge that individual farmers mainly used to guide decision making, problem solving, increase understanding and for innovation was information from neighbours, other farmers and friends. Other farmers used information on production resources, their own motivation, information from parents and government policy (see **section 10.3.3.2**). Based on this finding, this study concludes that farmers preferred to use information that was local, informal and easily accessible. Farmers belonging to a group had more skills, knowledge and information, as well as access to credit which facilitated decision making compared to farmers not belonging to a group.

#### **13.3.5.4 Conclusions on satisfaction / non satisfaction with the decision(s) or innovation or solution and why or why not**

- Most farmers were satisfied with the information and knowledge used and the outcome of decision, and reported positive outcomes, but some were dissatisfied and reported reduced incentives to farm, demoralisation due to lack of market, and poor performance of the enterprise and high cost of inputs. More farmers' groups than individual farmers perceived that they had

realised increased income or profit. Farmers' groups were thus more satisfied with the information used for decision making than individual farmers.

- More farmers not belonging than belonging to a group were adversely affected by decision(s) made on choice of enterprise(s) and realised negative outcomes because farmers belonging to a group had better access to information and knowledge through their groups than farmers not belonging to a group. It is thus concluded that knowledge enabled farmers to make decisions that are more informed.
- Groups were risk takers and were more likely to apply new information and try out new enterprises and farming practices hence produced large quantities for selling. Individual farmers were risk averse and preferred to work with what they knew or were convinced worked well or tried out small quantities. Consequently, where there was no market or good profits, the groups were more adversely affected than individual farmers were.
- Farmers' groups were knowledgeable and had much to offer in community development. However, a significant two fifths of the groups derived below average level of satisfaction in terms of their involvement in decision making activities in the community.

#### **13.3.5.5 Conclusions on processes involved in group versus individual decision making**

- Decisions made by individual farmers were unique because each decision was based on the unique mental models of the individual on farming. The mental models depended on the individual's knowledge assets, experiences, skills, values, beliefs and their circumstances.
- Individual decision making differed from group decision making. This study showed that individual decision making was simple and was influenced by the needs of one individual's knowledge, experience, values and beliefs while group decision making was moulded by the consensus of group members hence was richer and deeper but more complex.
- Group decision making was the preferred mode of decision making because it was perceived to be reliable, exhaustive, well researched and based on a deep and exhaustive knowledge base comprising the collective knowledge assets of the group. Group decision making was also enlightening and empowering to both the slow and the fast thinkers in the group. The joint decision making process inculcated ownership of the decision, united the group, and brought group members to the same level of understanding. However, despite the preference for group decision making, the most frequent decision making approach was individual decision making (Solano *et al.* 2001:190).

#### **13.3.5.6 Conclusions on sufficiency of knowledge and information in the AKIS**

- The information and knowledge available in the present AKIS was not sufficient to address the needs of small-scale farmers. The gaps identified point to a mis-fit between national plans and district plans and the agricultural sector development achievements.

- Although the GoK had developed a draft information policy, the PRSP, SRA, the ERS and the Vision 2030, and the Ministry of Agriculture had developed a new strategic plan, the resources available and those allocated did not match the implementation plan and a wide gap persisted in terms of the provision of agricultural information and knowledge (RoK. Ministry of Finance and Planning 2002a:18; RoK. National Development and Vision2030 2008:66-67).

#### **13.3.5.7 Conclusions on barriers and constraints small-scale farmers face in accessing agricultural knowledge and information**

- There was little attention paid to the barriers and constraints encountered by small-scale farmers in accessing agricultural information and knowledge. The main barriers and constraints included a limited number of extension workers, inadequate credit facilities, over subdivision of land and insufficient capital for implementing new technologies and farming methods, insufficient information and knowledge resources, not knowing the sources of information, inadequate information retrieval skills, illiteracy and language, and a poor culture of sharing information and knowledge.
- Although print media were important for small-scale farmers for sharing agricultural information and knowledge, there was little targeted repackaging of relevant content in appropriate formats and language. Where repackaging had been done, there was insufficient awareness creation of the resources and the materials were not available to farmers.
- The key barrier to accessing and sharing local knowledge was not knowing who had the local knowledge (the “knowers”) because knowledge was not captured and recorded to improve its access to others who might benefit from it.
- Funding was a key constraint at all levels from national to the individual farmer level. Farmers did not have sufficient income to implement their ideas based on new information and knowledge that they acquired. On the other hand, the outcome of the implementation of the 1997-2001 development plan showed a project completion rate of 19%, and the key constraints included a mismatch in district planning and implementation funds, and a misfit between national development plans and district development plans (RoK. Ministry of Finance and Planning 2002a:18).

#### **13.3.6 Conclusions on the current practices in managing local knowledge and external information among farmers**

This section presents conclusions based on the study findings on information management and knowledge management practices in Kirinyaga district.

#### **13.3.6.1 Conclusions on external information management practices**

- Information management and knowledge management practices improved access to agricultural information and local knowledge. The information management practices in place in Kirinyaga district were basic and the efforts of the different actors were scattered, uncoordinated and there was no bibliographic control. Thus, small-scale farmers faced challenges in accessing and sharing timely and comprehensive agricultural information.
- Most of the current practices of managing external agricultural information were oral and traditional. Information was mainly collected and shared orally through information providers (see **section 11.1**). Most farmers' groups captured external information from oral sources through meetings, training and exhibitions. The group secretary captured and recorded the information in minutes, while individuals wrote personal notes in their notebooks. However, working with Powell's (2003:1-2) definition, information management entailed "working out what information is needed by the people with whom you work, where it might come from, and what they need it for," it is concluded that farmers' groups and other actors in the district had competence in working out the information that the audience they served needed, knew the sources of information, and could use and reuse the information whenever needed, regardless of the storage medium - in their head, notes, minutes or in print collections.
- Farmers' groups, individual farmers, the Ministry of Agriculture and other actors in the district used simple traditional information management methods to facilitate retrieval and enlighten group members and other community members, but there was a need to adopt modern information management practices.
- Farmers' groups meetings were important in managing external information such as in accessing and disseminating agricultural information but the culture of not sharing beyond group members was a barrier to disseminating information and led to information asymmetries.
- Some CSOs, training and education institutions, research institutions and government departments in Kirinyaga district and in Nairobi collected, processed and stored different types of materials mainly for use by their staff but the resources were not accessible to small-scale farmers. The Ministry of Agriculture maintained the "Information desk" in Kerugoya, which was open to the public, but there was a need to strengthen the information resources and offer information services that targeted the needs of small-scale farmers to harness the information contained in the documents. In addition, there was a need for systematic and coordinated information management to facilitate collection, processing, sharing and usage of agricultural information.

#### **13.3.6.2 Conclusions on local knowledge management practices**

- Knowledge management plays an important role at individual, group and organisation levels in the agricultural sector. However, very few farmers captured, recorded and shared local knowledge. Small-scale farmers in Kirinyaga district possess a variety of local agricultural knowledge assets, but the knowledge has not been captured and recorded.

- Local knowledge from elders, parents, group members, neighbours or CSOs was captured orally and recorded and stored in people's heads, personal notebooks and group minutes, and was shared among group members through meetings and CoPs. By sharing knowledge and know how, farmers built on each other's experiences and generated new knowledge. The method used for sharing or transferring knowledge was dictated by the social structures and culture of the community and while some shared through clans and families, others shared through social gatherings or networks and different types of groups.
- Oral communication channels had been in use for centuries for managing local knowledge and had proved effective in passing on knowledge from the clans, elders and parents to the younger generations. The AKIS perspective also provided a path for managing the local knowledge of different actors by providing a space or platform for interaction and sharing knowledge. However, conventional knowledge management was crucial for effective capture, recording and sharing of local knowledge.
- KENRIK, the AIRC, KARI and KENFAP captured knowledge from exhibitions, shows, surveys and publications orally through interviews, through observation, participatory appraisals, audio tapes and videos and recorded in audio tape format, radio, print (brochures, books, newsletters), documentaries, videos, CD-ROMs and databases. The knowledge recorded was shared through workshops, training, expert discussions, newsletters, brochures, videos, visitors to their offices, demonstrations and books and through the resource centres established in Nairobi. The knowledge was used to improve their farming activities, reduce production costs, conserve the environment, improve human health. However, most of the knowledge captured and recorded had not reached small-scale farmers in Kirinyaga district.
- Although there was low usage of modern ICTs for capturing, recording and sharing local knowledge, these tools had great potential for facilitating the sharing of knowledge. For example, cellular phone based options had proved to be a viable option for farmers in rural areas for sharing knowledge.

### **13.3.7 Evaluation of the methodology**

As discussed in **section 3.1.2**, a bricolage of paradigms and perspectives; theories and concepts, models and framework; methodologies and methods were used to guide the study and facilitate greater understanding of the AKIS of small-scale farmers in Kirinyaga district. This multiple research methods design guided the different facets of the study of AKIS by tapping on the strengths of the different components. For example, the Social constructivist approach supported the learning process of farmers' group members, while the Naturalistic paradigm guided inquiry on studying the usage of information use. The Participatory paradigm facilitated the participation of rural people to express themselves using their own words, language and images. Although it was in some cases difficult to

see where one paradigm started and ended, this pluralistic approach provided multiple lenses for studying AKIS, which provided an holistic picture of different phenomena (see **section 3.1.2**).

This study observed that the multiple method research approach took a lot of time and resources, and made the study large and complex. As pointed out by Johnson and Christensen (2008:456), mixed methods research designs were complex and required more time and resources. For example, several data collection methods were employed (see **section 5.5**), and analysis of the data collected was challenging because there were multiple data sets, and analysing and integrating the data to bring out meaning was complex, laborious and time consuming. For instance, before going to the field, the researcher assumed that some of the methods would not work hence would be complemented by alternative methods. However, fieldwork was very successful, and all the methods worked well and produced a massive data set. There were more than 260 interviews and focus group discussions to be transcribed and coded in NVivo and SPSS, which proved to be tedious and time consuming (see **section 5.7**). In addition, there were several sets of PRA and RAAKS drawings from each of the four divisions of Kirinyaga to be re-drawn and to make sense of, as well as to merge with the other data sets.

All methodologies and data collection methods had advantages and limitations (Frankfort-Nachmias and Nachmias 1996:205; Creswell 2003:20-21; Sekaran 2003:256), as discussed in **sections 5.1 and 5.5**. As acknowledged by Creswell (2003:20-21), different research methodologies help to capture the best of both qualitative and quantitative approaches, and play peculiar roles in trying to understand the world around us. For example, in the case of the present study, combining qualitative and quantitative methodologies produced complementary data sets that were synergistic and helped to answer the research questions appropriately. The Sense-Making methodology proved very useful in probing the activities of small-scale farmers in space and time and helped them to reflect on past situations, the gaps they faced, the bridges that helped them overcome the gaps and the outcomes and impacts of using agricultural information and knowledge. However, as pointed out by Dervin and Reinhard (2006), there were disagreements and criticisms regarding this methodology. While one group argued that communication across fields lacked uniformity and was diverse and chaotic, the other group was committed to improving user studies. On the other hand, the use of the participatory methodology enriched the study by empowering farmers to become researchers and arrive at solutions to some of their problems. As summarised by Cohen, Manion and Morrison (2007:78), the choice of methodology and research design is determined by the purpose of the research.

At each data collection site, participants of the study were briefed and the purpose of the study was explained and their consent requested, and at the end of the data collection session, a concluding session was held with all the participants and research assistants. Interviews (individual and focus

groups) (**section 5.5.1.3**) helped to establish rapport with the participants and informants and to explore complex issues by bringing out diverse views and perspectives and arriving at a group consensus that validated the study findings. However, as pointed out by various authors (Easterby-Smith, Thorpe and Lowe 2002:86; Sekaran 2003:257; Leedy and Ormrod 2005:185), conducting interviews is expensive and posed the danger of introducing subjectivity and bias. For example, the present study took about four months to gather data, and some of the focus group discussions lasted three and a half hours. Questionnaires were effective and were particularly appropriate for this study, where information providers were distributed in a wide geographic area.

A key disadvantage was the response rate (Sekaran 2003:257). In the case of the present study, several reminders were sent out to yield a response rate of 50%. Unobtrusive observations provided an insight into complex issues and data collected was direct and “uncontaminated.” This approach helped to clarify and provide understanding into some of the data collected through alternative methods. However, the observation component of the study proved expensive and time consuming (Sekaran 2003:257), and at times, it was difficult to make sense of what was being observed. The concluding sessions at each data collection site proved useful in highlighting issues and participants were given an opportunity to ask questions and be briefed on the subsequent steps. Participants of the study unanimously agreed on the need to disseminate the study findings through a dissemination workshop.

PRA component of the study was carried out simultaneously with the interviews and the focus group discussions. The timelines provided an insight into historical perspectives of agricultural activities and access to agricultural information and knowledge and changes over time and space. Although some participants did not want to draw, the younger people in the group were happy and willing to draw. The action research (RAAKS) component yielded rich and comprehensive data summarised in visual formats that were complementary to the data collected through the other methods. Conducting the RAAKS component of the study last was insightful, as it enabled the RAAKS team to draw from the learning from the other methods in the four divisions. However, the experience of the study was that RAAKS required institutional support, good training and adequate resources. Nevertheless, the PRA and PAR fed back knowledge that agricultural actors and the community in general were able to apply to improve their practices (Herr and Anderson 2005:110-111). For example, the Venn diagrams, the network diagrams, the Service and Opportunity maps, and the Septagrams provided pointers to weaknesses in the AKIS and solutions on how to improve the system. Discussions on the importance of sharing external information and knowledge among individuals and across groups also highlighted existing challenges of non-sharing culture and highlighted solutions or measures required to improve access to information and knowledge.



Although efforts were made to select a large sample size and to include equal numbers of mixed groups, female only, male only and youth only groups, very few youth groups participated in the study, and there were more male than female farmers. This posed challenges in interpreting and generalising some findings, especially those pertaining to youth farmers. The present study aimed to maximise validity and reliability of data collected. As pointed out by Mugenda and Mugenda (2003:79,95), the accuracy of the data collection instruments enhances the quality of research. To ensure that the instruments collected data that was relevant and correct, pre-testing of instruments was done to increase the reliability of the data collection instruments. The triangulation of qualitative and quantitative approaches and multiple data collection methods yielded corroboration and complementarity where some methods were more effective than others thus made the findings reliable and credible. According to Hesser-Biber (2010:88,89), reliability and validity increased if all important questions were asked and where cross checking mechanisms for addressing subjectivity and other errors were inbuilt into the research process. The present study asked comprehensive and in-depth questions, which were answered by multiple audiences (farmers, farmers' groups, information providers and other agricultural actors), through multiple approaches and perspective, thus increasing reliability and validity of the findings.

In sum, the challenges experienced by the present study were consistent with those established by Bryman (2008a) and reviewed by Creswell, Plano Clark and Garrett (2008). The experience of the present multiple methods research was that some of the findings were contradictory. Johnson and Christensen (2008:456) observed that in some cases, qualitative and quantitative findings yielded contradictory data. For example, farmers groups were diverse and needs were location specific and there were slight variations in the views expressed by different focus group discussions and data collected through interviews, focus group discussions, PRA, RAAKS and observation. Moreover, the mixed method design study of AKIS was complex and large, and was expensive to conduct in terms of time and resources required in planning, collecting and analysing data, and reporting. The study required specialised skills in community development and participatory approaches, and although a large team of research assistants with complementary skills and experience were trained, biases in data collection may have crept in considering their different backgrounds and mental models. However, the large team was necessary in the gathering of data for a multidisciplinary and multifaceted study. Data analysis and integration of the huge qualitative and quantitative data sets collected from the cocktail of methods proved challenging. As pointed out by Stilwell (2006:3) understanding the logic of these combinations would contribute to the understanding of pluralistic approaches. Despite the challenges, the multiple methods design study yielded comprehensive, rounded and valid data that provided understanding of the AKIS of small-scale farmers and helped answering the different research questions.

### **13.3.8 Limitations of the study**

Although probability sampling was used to select farmers' groups through cluster sampling, non probability sampling (snowball and purposive) methods were used to select the sample of farmers not belonging to a group and key informants hence the findings cannot be generalised. In addition, this study had limitations in that the findings on AKIS were localised to Kirinyaga district, hence some of the findings could not be generalised to other areas or countries. The findings of the present study showed that AKISs are location specific hence; the findings on the AKISs of Kirinyaga district pertained to that geographical area only. In addition, the sample size of youth groups that participated in the study was small hence, some of the findings on youth groups cannot be generalised. However, the research design, theoretical framework, methodology and methods used can be applied in other areas and countries. Many methods were triangulated, which had many merits and some demerits. Some of the instruments used for data collection, especially the interview guides for farmers' groups and the individual farmers were long (taking about three and a half hours) and some informants expressed interview fatigue towards the end of the interviews, affecting the quality of responses provided. In addition, the multiple methods resulted in a massive store of data, which required much time for analysis and synthesising.

Another limitation of the study was the very broad nature of the study, and the coverage of all the four divisions of Kirinyaga district required much time, money and energy. There were challenges in getting some group members to participate in the focus group discussions because of their busy farming and household chores, hence the under representation of women and youth in the study sample. Some did not participate because they did not see tangible benefits in participating in the study. Some informants had very high expectations and viewed the present study as the mouthpiece they were waiting for to air their problems and bring quick solutions. Finally, there were many (29) data collection assistants with varying backgrounds and experiences, and whereas care was taken to attain a mix of gender, skills, experience and knowledge of the study area, and to train the assistants, the different individuals may have introduced personal biases and subjectivities.

### **13.4 Recommendations**

This section presents the recommendations of the study on socio-demographic characteristics of small-scale farmers, information behaviour, sources of agricultural information and knowledge, linkages and flows of information, usage of knowledge and information, and information and knowledge management practices. While some of the recommendations were unique to specific objectives and research questions, others cut across other study objectives and are highlighted under the respective sections.

#### **13.4.1 Recommendations on the socio-demographic characteristics of small-scale farmers**

1. Group membership fostered the adoption of new technologies and farming methods. There were more farmers belonging to a group than not belonging to a group who had adopted newly introduced enterprises such as TCB and dairy goat, and who had access to information and knowledge. Besides, agricultural services were mainly delivered to farmers through groups, hence there were information asymmetries between farmers belonging and not belonging to a group. To address the information asymmetries, it is recommended that the government and other actors encourage farmers who are not in groups to form groups, or to join existing ones in order to access services and gain from the social capital of groups.
2. The study findings on the socio-demographics of the farmers revealed gender differences in terms of levels of education, leadership positions and participation in decision making. To address these inequalities, it is recommended that the government and the international community formulate policies and strategies that would significantly increase the numbers of women in decision making positions at all levels, to ensure full participation by women and the youth in agricultural development, and improve access to services and opportunities.
3. Although Kenya is a signatory to international conventions such as the Convention on the Elimination of all Forms of Discrimination Against Women (CEDAW), and the government had adopted affirmative action in the public sector, rural women farmers appeared to have been excluded from these commitments. It is thus recommended that: i) affirmative action is adopted at grassroots level to ensure that gender differentials are addressed and that the different stakeholders are compelled to increase the participation of women at decision making levels to ensure their full participation in development; ii) awareness of CEDAW is heightened through the provision of information to enable female farmers to know their rights and take advantage of opportunities and services that contribute to improved productivity.
4. Very few farmers' groups and individual farmers shared the objective on conserving the environment. Based on this finding and those of other authors (McClelland, Gartmann and van Rees 2004:6), it is recommended that: i) the government and other agricultural actors motivate farmers to engage in sustainable NRM in order to conserve the environment and biodiversity for the benefit of the larger community; ii) information providers focusing on NRM related topics repackaged information in appropriate packages for small-scale farmers and students.
5. The socioeconomic and characteristics of small-scale farmers such as education level, age and membership to groups of small-scale farmers have an effect on the information behaviour, sources of information used and linkages that farmers establish with the different actors (see **section 6.2**). Based on these findings, it is recommended that social inclusion strategies be formulated that ensure that the literates and illiterates, the old and young, those belonging and not belonging to groups have access to agricultural information and knowledge and other agriculture related opportunities.

### **13.4.2 Recommendations on the information behaviour of small-scale farmers**

This section presents the recommendations of the study based on the key findings on the information needs of small-scale farmers and answers three research questions on information needs of farmers, throws light on their information seeking behaviour in relation to the groups in Kirinyaga district and their roles in facilitating the exchange and sharing of knowledge and information.

#### **13.4.2.1 Recommendations on the agricultural information needs of small-scale farmers (men, women, youth)**

1. Farmers had diverse and multidisciplinary needs relating to various enterprises and aspects on the market value chain, hence they needed information from multiple agricultural and non-agricultural sources to satisfy their information needs. The needs of farmers were also dynamic and new needs emerged as older needs were satisfied. It is, therefore, recommended that linkages between the different AKIS actors operating in the district be strengthened or be forged where they do not exist, to ensure the needs of rural producers are met.
2. The present study and other authors (Easdown and Starasts 2004) showed that there was a wide information gap between the needs of farmers and the information provided to farmers and the emerging needs on new technologies and improved farming methods. The present study restates the recommendations made by earlier authors namely that of: i) Kaniki (1994a:53), Oettie and Koelle (2003:12) and Bawden (2006), on conducting regular needs assessments to address the dynamic needs of farmers; and ii) Colle and Roman (2003:42), and Mchombu (2004:34) involving community members in the assessments to articulate their needs to ensure the needs of farmers were updated.

#### **13.4.2.2 Recommendations on information seeking behaviour of small-scale farmers (men, women, youth)**

1. This study and those of other authors (Kaniki 1989:73; Mchombu *et al.* 2001:187) showed that there were age and gender differences in the information needs, seeking patterns and sources of information (see **sections 6.2 and 6.3**). Like Leckie (1996:319) and Trauger (2001:66), this study recommends that: i) planners and information providers formulate gender and age differentiated strategies that focus on male, female and youth farmers, and school children; and information providers repackage gender differentiated information products and services that are targeted at male, female and youth farmers, and schoolchildren.
2. Most farmers who could not find the information they needed cited the challenge of the limited availability of resource persons. This challenge pointed to the need to strengthen the human resource capacity of information providers to be able to meet the needs of the critical mass of small-scale farmers. It is thus recommended that the government and other relevant actors

increase the number of extensionists and other information providers to ensure the varied needs of farmers were adequately met.

3. Some farmers did not seek information because they were not aware of the pluralistic approach to service delivery and were still wedded to the old system of extension officers visiting farmers on their farms. It was observed that the group strategy discouraged some individual farmers from seeking information from extension officers. It is thus recommended that farmers be sensitised to change their mindsets from the previous reactive approach of waiting for extension officers to visit and adopt a proactive culture of seeking information or joining groups and demanding for service to avoid information asymmetries.
4. Some of the training offered to farmers was perceived to be too theoretical. The present study, and that of other authors (Meyer 2000:142-144; Rees *et al.* 2000:14; Bagnall-Oakeley *et al.* 2004:124) showed that farmers learned best by “doing,” through interactions with intermediaries, practical demonstrations and study tours. To improve the effectiveness of training, it is recommended that training sessions for farmers combine theory, practice, demonstrations and study visits, and be based on the cultural and social realities of the community being trained.
5. The present study and Hoffmann, Probst and Christinck (2007:361) showed that most farmers did not have access to information on best practices about the mixing of external agricultural information and local knowledge. Based on this finding, it is recommended that researchers work with knowledgeable farmers to validate local best practices and innovations on the mixing of external and local knowledge in order to capture and document knowledge and innovations for the benefit of other farmers.
6. This study established that external information systems and local knowledge systems were important in ensuring sustainable agricultural production. However, most information providers did not provide local knowledge to farmers. It is thus recommended that information providers, including libraries and resource centres adopt a policy of providing both external and local knowledge in order to expose farmers to credible knowledge from the two knowledge systems.

#### **13.4.2.3 Recommendations on farmers’ groups in place in Kirinyaga district, their characteristics and the roles they play in facilitating the exchange and sharing of knowledge and information**

1. Based on the study findings on the different types of groups available in Kirinyaga district, and the different roles that men and women play in farming, as well as the findings by Gotschi, Njuki and Delve (2009:273,275) on mixed groups harnessing more social capital compared to female only and male only groups, it is recommended that more mixed groups be established to ensure the inclusion of men, women, and the youth in agricultural development and tap the synergies from the different genders and age groups.
2. This study showed that farmers’ groups experienced challenges pertaining to the management of groups and resources for carrying out the activities of the groups. It is thus recommended that the capacity of farmers’ groups be strengthened to address problems of conflict in groups, and

information and knowledge sharing through leadership training, provision of skills in organisation development, conflict management, information management and knowledge management.

### **13.4.3 Recommendations on the sources of agricultural information**

This section highlights the key recommendations based on the findings of the study on sources of information and knowledge, users of the agricultural knowledge and information of information providers and the AKISs in the district as well as the features of the system.

#### **13.4.3.1 Recommendations on where farmers get their agriculture-related information and knowledge**

1. Small-scale farmers obtained information from diverse sources offering information on farming in general, on news about a new technology or farming method, and for answering a farming question or for specific enterprises. Most of the information was scattered among the different and actors in the AKIS and some was not aligned with the needs of farmers. Based on these findings, it is recommended that: i) linkages between actors be strengthened to facilitate the flow of information and knowledge; information be aligned with the needs of farmers through repackaging in appropriate formats and language; and iii) information and knowledge assets be collected and documented to facilitate easy access from a central point.
2. Public extension services were the key source in meeting the different types of agricultural information and knowledge needs of small-scale farmers, followed by the private sector actors then neighbours. Extension workers were perceived to be well-trained, knowledgeable sources of comprehensive information. As pointed out by Morris and Stilwell (2003:75), users preferred sources that were accurate, credible, appropriate and relevant. Given the central role of extension officers in the AKIS of Kirinyaga district, and the limitation of their small numbers (see **section 8.2**), it is recommended that: i) the number of information providers and in particular extension officers be increased at location and sub-location levels; and ii) the capacity of information providers be strengthened through training and re-training to enable them to serve the critical mass of small-scale producers with up to date knowledge.
3. This study showed that farmers preferred to use people as sources of information that were easily and locally available. Based on these findings and Stilwell (2002:76), caution is advised in that in some cases, personal sources have their limitations such as inaccuracies, lack of recency and relevance. It is thus recommended that: i) information providers exploit the strategy of using people sources such as experts and media such as the vernacular radio stations as sources of information as communication channels for disseminating important agricultural information, but in addition; and ii) relevant actors work together with small-scale farmers to repackage relevant agricultural content in appropriate formats and languages to ensure that farmers used accurate, relevant, comprehensive and current information.

4. The present study observed a gap in marketing, markets and price information. In addition, there was low usage of market information systems and a weakness on the part of producers compared to the market side. According to Mukhebi, Mbogoh and Matungulu (2010:20), government statements on improving marketing linkages had not been matched with sufficient investments to effectively link farmers to markets. Based on these findings, it is recommended that: i) the government and other relevant actors develop policies and strategies that improve the marketing system and address previous biases by providing equal emphasis to the demand and supply sides; ii) the government and other relevant actors provide adequate resources to provide the necessary market infrastructure to facilitate implementation of government plans on strengthening and improving market linkages. The need to avail farmers of sufficient resources is inbuilt into most of the study recommendations; iii) actors engaged in market information such as the Ministries of Agriculture and Livestock Development and other relevant actors in the private sector and NGOs be strengthened and equipped with skills in collecting, synthesising, repackaging and disseminating timely, and comprehensive market information that was relevant to the local needs of farmers using appropriate communication media, format and language; iv) given the high investment that goes into developing information systems such as KACE, Foodnet, Tradenet and NAFIS, and based on the findings of the present study on the low usage of information systems based on modern ICTs, it is recommended that sufficient resources be provided for training users to ensure the target audiences had adequate information retrieval skills; and v) relevant local content be packaged and uploaded in the existing market information systems and that awareness creation and training on how to use the systems be conducted to improve the uptake of the systems.
5. Based on the finding on providers of market information offering similar services, it is recommended that the actors involved in repackaging market information collaborate and build upon existing systems to improve and expand the system instead of duplicating efforts.
6. Although the quality of information was generally good, there were significant numbers of participants who perceived the ease of finding information, reliability, relevance and usefulness to be below average. Based on these findings, it is recommended that the quality of agricultural information provided to farmers by the different actors be improved by providing accurate, factual, and comprehensive information based on farmers' needs.

#### **13.4.3.2 Recommendations on users of the agricultural knowledge and information of the information providers**

1. The findings of the present study showed that there were diverse users of the agricultural knowledge and information provided by different actors in rural areas. However, users such as small-scale farmers were heterogeneous and had diverse and varying needs that could not be generalised. It is thus recommended that information providers map out the users of their information products and services and understand their met and unmet needs, communication

media preferences, expectations and what they use, in order to establish outstanding needs and repackaging appropriate information products and services.

#### **13.4.3.3 Recommendations on the AKISs of small-scale farmers in Kirinyaga district**

1. This study showed that the AKIS of Kirinyaga district had many sub-systems and many actors scattered in different geographical locations providing diverse but complementary services. Moreover, there were many AKISs, which were location specific. The linkages between actors were weak and there was poor coordination between the activities of the different actors. Recently, the GoK developed an agricultural sector communication strategy to help improve communication and linkages between actors. This study commends the action of the GoK and recommends that the Ministry of Agriculture and the Ministry of Livestock Development in Kirinyaga district develop a communication plan for Kirinyaga district to respond to the diverse and complex information, communication and knowledge needs of farmers and other actors.
2. Extension services were a key actor in the AKIS of Kirinyaga district and a key source of information for small-scale farmers. Based on the finding that FEOs did not have means of transport to carry out their work in the different location or sub-location, it is recommended that the government provide transport to FEOs to facilitate movement.
3. Farmers' groups were key actors who set the scene in the agricultural sector in Kirinyaga district and were a source of information and knowledge. Farmers' groups provided a good network for reaching the grassroots that extension services had not been able to reach. However, this study showed that only a few farmers not belonging to a group obtained information from groups. It is thus recommended that farmers' groups be sensitised and encouraged to share information and knowledge with other members of the community.
4. Local markets were key actors, outlets for farmers produce and principle sources of marketing and price information for small-scale farmers and in addition to being sources of other types of information exchanged through interactions by the varied actors in market places. The Ministry of Agriculture had also mounted the "Information desk" at some local markets on market days. Based on these findings, it is recommended that markets be equipped with "information hot spots" or information and knowledge market corners, where different actors could show case their information and knowledge resources to the public.
5. This study showed that there were very few farmers between the ages of 18 and 25. Given that agriculture is the engine for development in Kenya, the low figures of youth farmers engaged in farming as a business poses challenges to the sustainability of agriculture in the region. The youth also faced special challenges because they did not own land, and could not access credit or collateral and did not have sufficient farming experience and skills. Based on these findings, it is recommended that: i) the government and other relevant actors develop policies and strategies that provide agricultural support to the youth in accessing land and credit in order to sustain agricultural productivity and reverse the rural-urban migration; ii) training institutions, schools



and other relevant actors provide special training to the youth to equip them with relevant skills on farming; and iii) information providers repackage appropriate content based on the priority needs of the youth in appropriate formats and language.

#### **13.4.4 Recommendations on the linkages and flows of knowledge and information between actors and channels of communication**

This section presents the key recommendations of the study based on the findings on six research questions focusing on the primary stakeholders, linkage mechanisms between actors and the types of linkages, flows of information, communication media used, ICT preferences for accessing agricultural information and knowledge.

##### **13.4.4.1 Recommendations on the primary actors**

1. Many active primary actors in Kirinyaga district were involved in the generation and dissemination of agricultural information and knowledge. Empirical evidence based on the present study showed that extension services were key actors in the AKIS of Kirinyaga district and had positively affected improving productivity. Multiple actors were involved in extension service delivery including public sector extension, NALEP, the private sector extension and CSO actors. It is thus recommended that extension services offered by different actors be rationalised, harmonised and strengthened to facilitate the flow of vital agricultural information and knowledge to small-scale farmers. Vertical linkages between extension actors need to be established and strengthened through complementary joint activities that tapped on the strengths of the different extension actors.
2. Although the present study found that there were partnerships between actors from different sub-systems such as under the NALEP programme, the Ministry of Agriculture, Africa Harvest and TechnoServe partnership, the linkages were not formal and there were insufficient resources to scale up their activities in the district. Besides Laurent, Cerf and Labarthe (2006:12) noted that private extension services are not able to fully meet the knowledge and information needs of the critical mass of farmers. Klerkx and Leeuwis (2009:101) revealed that there were problems with embedding private extension actors in the AKIS in a sustainable manner. Based on these findings, it is recommended that: i) Private-public partnerships be formalised and integrated into extension policy as these partnerships were important building blocks for increasing agricultural productivity; and ii) the new policies and strategies formulated, such as the ASDS be supported by the provision of sufficient human capacity and budget to support the cooperative activities, and policies be formulated to formalise and strengthen the linkages. Good policies remain good as long as they are implemented through effective strategies and sufficient resources.

#### **13.4.4.2 Recommendations on linkage mechanisms and the types of linkages between actors**

1. This study showed that there were weak and missing linkages between actors, poor relationships between some actors and farmers and poor coordination of activities. To address these challenges, the GoK formulated the ASDS, which adopts a sector-wide approach through public-private partnerships. While the present study commends this important development, which facilitates the strengthening of linkages, Mukhebi, Mbogoh and Matungulu (2010:21) observed that the conditions for implementing sector-wide programmes were not in place. Further, an assessment of the monitoring and evaluation practices in the agricultural sector concluded, “monitoring and evaluation in its true sense is virtually absent” (GoK 2010). It is thus recommended that: i) sufficient human and budgetary allocations be provided to facilitate coordination of actors; ii) proper monitoring and evaluation systems be put in place and performance measures and indicators of success be identified to guide implementation; and iii) appropriate policies are developed to facilitate formalisation and strengthening of linkages.
2. Among the important linkage mechanisms identified by the present study were the Kirinyaga stakeholder’s forum, social networks, committees, “Community parliaments” and farmers’ groups (see **sections 9.2 and 9.3**). This study showed that innovation amongst farmers came about through interactions, learning together and exchanging ideas, knowledge and information. However, linkages between stakeholders of the forum, networks and committees were weak and some experienced challenges of poor coordination and inadequate resources to carry out joint activities. It is thus recommended that: i) the capacity of the Kirinyaga stakeholder forum be strengthened through formalising relationships between institutions, individuals and networks; commitment by participating institutions; skills development in organisational development and networking; and through provision of financial resources to enable them carry out the coordination role and joint activities. Funding could be provided through bi-lateral arrangements between the government and development partners; ii) networking be facilitated within and among actors by formalising existing networks and strengthening them through provision of resources and skills on networking; and iii) participatory methods are promoted between actors to facilitate learning, innovation and sharing knowledge and information.
3. The present study showed that most farmers were resource poor and did not have adequate resources for buying inputs and the capital outlay required for introducing new enterprises. The present study also showed that although there were many credit and microfinance institutions in Kirinyaga district, agricultural credit was not affordable and accessible to most farmers and in particular to female farmers and the youth. Based on these findings, it is recommended that: i) linkages between small-scale farmers and credit or rural microfinance institutions be strengthened, and where not available be established, to provide access to capital for implementing agricultural activities; ii) credit and microfinance institutions develop gender and age responsive loan policies, practices and procedures that ensure the active unhindered participation of women and the youth in agricultural development; iii) the interest rates on

agricultural credit and microfinance are reduced to make credit affordable to even the most vulnerable small-scale farmers.

4. The present study showed dissatisfaction by farmers with most marketing actors due to mistrust and perceptions of unfair contracts. The present study and Lyon (2000:676-678) showed that trust was essential in establishing social relationships between farmers' groups and with traders, market intermediaries and horticultural exporters. Based on these findings, it is recommended that: i) the private sector and NGOs, which were the key marketing actors, as well as the public sector which does a considerable amount in gathering market information but is not visible, expand and improve activities pertaining to market and price information; and ii) the proactive actors, especially horticultural exporting companies renew and strengthen their relationships with farmers groups and re-grow trust to ensure fair and lasting marketing arrangements.
5. This study showed that most farmers belonging to a group were excluded from the process of drawing up marketing contracts between farmers' groups and horticultural exporting companies. Farmers perceived that the current contracts disadvantaged and exploited farmers and mainly favoured the exporting companies (see **sections 6.3.1.7 and 8.3.1.1**). Based on these findings, it is recommended that the government and other actors intervene to support farmers' groups in negotiating new contracts and providing farmers with comprehensive information on markets and prices. It is important that farmers are involved and informed of trade, market and business negotiations. As pointed out by Lyon (2000:678), the state and other external agencies have the obligation of supporting disadvantaged groups through risk reduction and provision of information on alternative actors in the marketing system and on new market opportunities.
6. Small-scale farmers had various types of linkages and the quality of their relationships with the actors in an AKIS differed, and varied from sub-location to sub-location. It is thus recommended that information providers base their information delivery strategies on the knowledge of actors that farmers perceived to be important and whom they had strong relationships with to ensure agricultural information and knowledge was effectively delivered to farmers.

#### **13.4.4.3 Recommendations on flows of information and knowledge between key actors (social ecology of groups)**

1. Most farmers' groups shared information and knowledge through group meetings, group activities such as training or addressing the practical aspects pertaining to the enterprises they produced as well as through social interaction. This study showed that groups provided a support network for learning, innovation and sharing of agricultural knowledge and information. However, some groups experienced challenges of conflicts and mismanagement. As recommended under **section 12.5.2.3**, farmers' groups need to be strengthened through provision of skills in organisation development and networking.

2. This study showed that some groups did not share their knowledge assets and information beyond the group boundaries. As recommended under **section 12.5.3.3**, farmers' groups need to be sensitised, motivated and encouraged to share information and knowledge with other members of the community.
3. Given the dominance of oral communication channels, it is recommended that platforms that facilitate face-to-face interactions between farmers and the diverse information providers be established.

#### **13.4.4.4 Recommendations of communication channels used by actors (men, women, youth)**

1. The present study showed that male, female and youth farmers preferred different communication channels. Farmers preferred to use interpersonal communication channels while the ICT tools preferred included radio, cellular phone and TV. Based on these findings, it is recommended that information strategies developed for disseminating agricultural information and knowledge combine traditional face-to-face and electronic communication channels.
2. This study showed that although some farmers used ICTs for accessing and sharing agricultural information and knowledge, farmers expressed the view that there were varying levels of effectiveness and experience in using the different channels. There were varying patterns in the usage of the traditional and modern communication channels. Besides, farmers required ICT skills and understanding on how to use the different ICT tools and information systems (Ochieng and Waema 2009; Storer, Thunder and Murray-Prior 2001). Based on these findings, it is recommended that: i) information providers examine the strengths, weaknesses, opportunities and threats of the key communication channels used in order to improve their effectiveness and ease of use for accessing and sharing information and knowledge; ii) farmers and other users be trained on how to use the various ICT tools and information and knowledge systems accessible to them; and information providers use gender differentiated communication channels that were favourable to specific gender groups based on the preferences of male, female and youth farmers.

#### **13.4.4.5 Recommendations on ICT usage and preferences of actors**

1. This study showed that the ICT preferences of farmers were radio, TV and cellular phones. Modern ICTs also held great potential in facilitating the sharing and exchange of knowledge and information (Karamagi Akiiki 2008:16; Mangstl 2008:5; Idiegbeyan-Ose and Akpoghome 2009:027). Small-scale farmers perceived that ICTs had impacted positively on their farming activities and had led to increased adoption of new technologies, improved access and speed of accessing information, facilitated learning and understanding, finding good markets and prices, savings on communication costs and improved communication. However, the present study identified several barriers to the use of ICTs in rural areas (see **section 8.6.7**). Based on these findings, it is recommended that: i) on the barriers to radio and TV programmes, media houses create awareness of the programmes planned before they are aired to enable more farmers to tune

- in; ii) on broadcasting times, these need to be adjusted to night time when farmers are resting from the farm and household chores; and iii) the content covered needs to be in tandem with the current needs of farmers, and the length of the programmes needs to be increased.
2. Based on the finding on the pervasiveness of the cellular phone in rural areas, it is recommended that: i) the barrier of educational level be addressed by exploiting voice technology in information systems developed for farmers; ii) the cost of calls directed to information systems for accessing agricultural information and knowledge be subsidised to promote use of available systems; and iii) training is provided to farmers on how to use the SMS and other services of the cellular phone.
  3. Although Kenya had a draft ICT policy, it remains in draft form. The findings of this study points to the need implementing the ICT policy to facilitate and guide information provision activities using ICTs. Based on this finding, it is recommended that: i) the draft ICT policy be finalised and sectoral agricultural policies, communication strategies and plans be formulated or amended to incorporate ICTs for accessing and sharing agricultural information and knowledge to abate marginalisation of rural agricultural communities and the digital divide; ii) the information policy which emphasises the need to develop rural ICT infrastructure match the implementation strategies and plans with sufficient funds in order to improve access to ICTs in rural areas; iii) the Ministry of Agriculture and Livestock development develop a sectoral policy on agricultural information policy encompassing all aspects of agricultural information and knowledge and communication; iv) rural electrification be fast tracked to ensure agricultural communities access to electricity, information services and other agricultural related services; v) gender differentiated policies and strategies be formulated to address the challenge of gender social exclusion in relation to ICTs usage and preferences in rural areas; vi) the cost for interactive calls to media houses on agriculture related information be subsidised or be made toll free to enable more farmers to interact, seek clarification and share their views; and vii) information providers provide a mix of traditional and modern ICTs to enable users to access information and knowledge using their preferred communication channel.
  4. With the laying of the fiber optic cable in rural areas in Kenya, it is recommended that the government, the private sector and civil society actors exploit the opportunities accorded by the ICT infrastructure and establish accessible, affordable and sustainable resource centres or “digital villages” equipped with relevant content in appropriate formats and language to provide a one stop centre where farmers can access agricultural information and knowledge.
  5. Farmers faced challenges of late payments for goods delivered to intermediaries and other market actors. Based on the finding on the preference for cellular phones, it is recommended that the marketing sub-sector exploit the application of cellular phone applications such as M-Pesa, ZAP and M-Kesho electronic money transfer service to pay farmers promptly upon receipt of goods at the farm gate or market or the marketing shed.

### **13.4.5 Recommendations on the usage of knowledge and information**

This section presents recommendations based on the findings of the study on the types of information and knowledge obtained by small-scale farmers; how farmers make decisions that deal with risk; their use of knowledge and information in decision making, innovation, understanding an issue or problem solving; individual versus group decision making processes. The section also highlights recommendations on the satisfaction with outcome; sufficiency or non-sufficiency of information and knowledge in the AKIS and how farmers go about seeking external information; and barriers and constraints in accessing information and knowledge.

#### **13.4.5.1 Recommendations on the types of information and knowledge farmers obtain from major sources**

1. This study showed that farmers mainly used operational information and highlighted gaps in information and knowledge in technical, awareness, market, strategic and tactical information, and post harvest information. Based on this finding, it is thus recommended that information providers repackage appropriate technical, awareness, market, strategic, tactical, awareness and post harvest information based on the needs of farmers.
2. Based on the findings on farmers having varying levels of education, and the low usage of market, awareness, technical, and post harvest information, the present study supports the recommendation by Kinengyere (2007:339-340) on the need to introduce information literacy programmes to increase usage of information, and to adopt strategies for delivering information to illiterate and semi literate farmers.
3. The low usage of market information among all categories of farmers point to weaknesses in the AKIS in the marketing sub-sector. Based on this finding, it is recommended that linkages between farmers and relevant marketing actors be strengthened to bridge the information gap.

#### **13.4.5.2 Recommendations on how farmers make decisions that deal specifically with risk and on knowledge and information that helped make the decision(s) or innovation or gain understanding or solve a problem**

1. Small-scale farmers used different types of information and knowledge to inform decision making based on the nature of decisions they needed to make. Farmers used knowledge and information on different aspects of farming including suitability of the area for the production of specific enterprises, switching of enterprises, financial information pertaining to profit likely to be earned, production resources, social factors such as poverty reduction, improved livelihoods, and human capital factors such as skills. It is thus recommended that information providers repackage comprehensive information packages comprising the different types of agricultural information on the major enterprises produced in the district.
2. Based on the knowledge and understanding on how farmers make decisions that deal with risk, it is recommended that information providers base their communication and information provision

activities on the decision making process of farmers to ensure appropriate and timely information was packaged for farmers.

#### **13.4.5.3 Recommendations on satisfaction / non satisfaction with the decision(s) or innovation or solution and why or why not**

1. This study showed that there were information asymmetries between farmers belonging and those not belonging to a group. More farmers belonging than not belonging to a group were satisfied with the decisions made on the choice and outcome of choice of enterprise, and perceived that they had obtained improved income and profits. In general, the findings showed that while some farmers were satisfied with the decision or innovation or understanding, others did not have sufficient information. It is thus recommended that: i) appropriate policies be formulated that take into consideration farmers belonging and not belonging to a group to improve decision making and address the information asymmetries; ii) as recommended in **section 12.5.2.1**, information providers need to assess the needs of farmers regularly and package appropriate information to meet new and emerging needs.

#### **13.4.5.4 Recommendations on processes involved in group versus individual decision making**

1. While decisions made by individual farmers or households were unique and were based on the knowledge base and mental models of the individual, group decision making was based on the objectives of the group and the collective knowledge assets of the group. This study showed, regardless of the type of decision making (group or individual), farmers needed diverse sources and types of information (see **section 9.4.6**). Based on these findings, it is recommended that information providers provide diverse sources of information and knowledge comprising different types of information including strategic, technical, awareness, operational, tactical and market information to facilitate decision making.

#### **13.4.5.5 Recommendations on sufficiency of knowledge and information in the AKIS**

1. This study showed that the knowledge and information in the AKIS of Kirinyaga district was not sufficient for the needs of small-scale farmers. There were weak and missing linkages between actors, and gaps in technical, awareness and market information, post harvest information and on new technologies and improved farming practices. However, different people, institutions and networks within the AKIS framework possessed knowledge, which was embodied in their practices and activities. It is, therefore, recommended that the knowledge possessed by the different actors be tapped by forging new linkages and strengthening weak linkages between relevant actors to improve the flow of knowledge and information.
2. In order to facilitate the implementation of the national agricultural development plans and ensure a fit between district and national achievements (see **section 9.5**), it is recommended that

up-to-date and comprehensive agricultural information and knowledge be made accessible to farmers through strengthening of linkages between key actors and improving the flows of agricultural information and knowledge.

#### **13.4.5.6 Recommendations on barriers and constraints small-scale farmers face in accessing agricultural knowledge and information**

1. One of the key barriers found in the present study in accessing information and knowledge was limited availability of information providers. Based on these findings, it is recommended that: i) the Ministry of Agriculture and Ministry of Livestock Development and other relevant actors in the private and CSOs to accommodate all categories of farmers in their delivering service strategies to allow for inclusion of farmers not belonging to a group; and ii) the number of extension officers and other information providers working with small-scale farmers in rural areas are increased to improve their reach (see **section 12.5.2.2 and 12.5.3.1**).
2. To respond to the barrier on inadequate information resources and inappropriate communication language it is recommended that information providers repackage and disseminate current and comprehensive agricultural and market information in appropriate formats and languages using their preferred communication channels.
3. The present study showed that there were very few sources of local knowledge and little sharing of local innovations and discoveries. Based on this finding, it is recommended that: i) the government in partnership with other relevant actors formulate knowledge management policies that facilitate the capturing, recording, sharing and usage of local knowledge to different actors in the agricultural sector; and ii) information providers in all sub-sectors avail both external and local knowledge to farmers to enable them to benefit from the advantages of the two knowledge systems.
4. Based on the finding of the present study on the barriers of insufficient information and poor access to information, it is recommended that: i) the government in partnership with other actors develop an agricultural information policy to facilitate the collection, processing, storage, dissemination of available agricultural information to improve access to information; ii) the different actors in the district collaborate and work together by improving linkages to tap the synergies of the different actors and ensure farmers receive comprehensive information based on their diverse needs. This would call for policies that facilitate the formalisation of linkages between actors (see **sections 12.5.4.1, 12.5.4.2 and 12.5.5.7**).
5. Recommendations on the poor ICT infrastructure and low usage of ICTs in accessing and sharing agricultural knowledge and information were captured above under section **12.5.4.5**.



### **13.4.6 Recommendations on the current practices in managing local knowledge and external information among farmers**

This section highlights recommendations of the study based on the findings on information management and knowledge management practices in Kirinyaga district.

#### **13.4.6.1 Recommendations on external information management practices**

1. The findings of the present study showed that the traditional information management practices currently used in Kirinyaga district did not facilitate efficient access to information when it was needed and that there were very few resource centres in Kirinyaga district. Given the importance of resource centres in collecting, processing and disseminating information, and in providing access to connectivity, it is recommended that: i) resource centres be established at district, division and location level and that conventional information management practices be adopted to facilitate the collection, processing, storage and dissemination and exchange of agricultural information as well as facilitate easy retrieval of information; and ii) officers in charge of agricultural collections be trained and equipped with information management skills or information professionals are employed to manage the collections.
2. Although the “Information desk” was open to users in the district, the resources available were limited and most farmers could not visit the headquarters to access the resources due to distance, time and cost barriers. It is therefore recommended that: i) the information and knowledge resources at the “Information desk” in Kerugoya be strengthened by increasing the size of the physical collection and that the concept be replicated at division and location levels to bring information closer to the users; ii) the government and other actors provide electronic access at multiple points at district, division and location levels.

#### **13.4.6.2 Recommendations on local knowledge management practices**

1. Based on the finding on the role that CoPs played in sharing local knowledge, it is recommended that the government and other relevant actors provide training to farmers’ groups on how to establish and manage CoPs.
2. The present study showed that conventional knowledge management was not practiced in Kirinyaga district and identified pockets of local innovations. It is thus recommended that a comprehensive knowledge audit on local agricultural knowledge be conducted by the Ministry of Agriculture and Ministry of Livestock Development in partnership with other relevant actors.
3. This study showed that only a few farmers and actors were involved in conventional knowledge capture and recording activities. The present study thus concurs with the recommendation made by earlier authors (Kaniki and Mphahlele 2002:14; Skyrme 2002; Ocholla 2007:244) on the need for formulating policies on local knowledge management and IPR to facilitate the capturing, coding, recording, documenting sharing and use of knowledge.

4. The key challenge to using local knowledge was that farmers did not know where to locate or source local knowledge. Based on this finding, it is recommended that: i) relevant actors in the community work together with the local community to map and document best practices on mixing the two knowledge systems; ii) based on the finding of the present study on the need for a knowledgebase on local knowledge, the present study commends the efforts of The World Bank (2009) in developing global and national databases on local knowledge and recommends the need for working in partnership with national governments and other relevant local actors in the capturing and recording of local knowledge; iii) the government of Kenya provides sufficient funding for the capturing, recording and sharing of local knowledge at all levels from community to national; and information providers need to identify and modernise local knowledge and provide the information and knowledge to farmers to harness the “hidden treasures” embedded in local knowledge.
5. The present study found that some farmers did not share local knowledge because they had no opportunities or forums for sharing. Other than KARI, which invited farmers to attend scientific meetings to share their knowledge, opportunities for sharing were limited. The present study thus recommends the creation of spaces or platforms where scientists and farmers can interact to share and exchange the different knowledge traditions, learn from each other and co-create new knowledge to address the challenge of power asymmetries between scientists and farmers.

### **13.5 Originality of the study**

Originality was addressed by investigating the AKIS of small-scale farmers in Kirinyaga district, which has not been studied before. This study adopted a unique, comprehensive and complex multiple methods research design that triangulated paradigms and perspectives; theories, concepts, models and frameworks; methodologies and methods to gather and analyse qualitative and quantitative data. The nature of the study was multidisciplinary and multifaceted as captured in the study objectives (see **section 1.4**) and addressed the management of local agricultural knowledge and information in the AKIS, as well as that provided by information providers to small-scale farmers and farmers' groups as opposed to just information exchange, which has been the focus of most past studies. Moreover, the study explored the role and potential of using ICTs in assessing and sharing information and knowledge. In addition, the study investigated gender differences with regard to information needs, information behaviour and usage of local agricultural knowledge and external information. The study suggests an AKIS model for small-scale farmers in Kirinyaga district.

### **13.6 Contributions of this study**

Wassenaar (2006:69) pointed out that for research to be of value, it should address issues that are important to a particular society or community within a society. The questions addressed by this study were of value to policy makers, researchers, extensionists, educators, CSOs, the private sector

actors and other small-scale farmers in Kenya as a whole, and more specifically to Kirinyaga district. The study is therefore in line with recommendations and resolutions made by the government of Kenya blueprints such as the Vision 2030, the SRA, ERS, PRSP and several strategic plans and programmes that advocate partnerships with farmers' groups to deliver agricultural services for enhanced agricultural productivity. This section highlights the contributions of the present study to the philosophical and theoretical foundations, the existing body of knowledge on AKIS, and to policy and practice.

### **13.6.1 Contribution to paradigmatic and theoretical framework**

This was the first study of AKIS constructed upon a complex triangulation of philosophies, perspectives, theories, models, concepts, techniques and framework, as well as methodologies and methods. A key contribution of this study is the application of pluralistic paradigms, triangulated theories, methodologies and methods in conducting a complex, multifaceted, multidisciplinary and comprehensive research on the AKIS of small-scale farmers. The philosophical worldviews of the Constructivism paradigm (combined with Interpretivism and Naturalistic inquiry) and the Participatory paradigms demonstrated a distinctive approach to understanding complex issues of a multi-faceted study on knowledge and information systems of heterogeneous target groups, and the research design has yielded deep, rounded and comprehensive results.

This study tested the Sense-making theory, Sense-Making Methodology and the Sense-making interviewing technique in studying the information behaviour and decision making processes of small-scale farmers. The findings showed that the Methodology worked well in situating farmers in their own circumstances in space and time, and highlighting their feelings and emotions, but questions pertaining to verbings relating to hunches, muddles, dreams and angst which would have helped to bring out the emotional framings in totality, could not be asked because these words did not exist in the vocabulary of the local community. The participatory approach allowed the local community to contribute towards their own development, for example, farmers were able to suggest solutions to some of the barriers and constraints they experienced in accessing information.

In addition, this study has shed light on the fuzziness of advantages and disadvantages of multiple methods design. The findings of the present study have demonstrated that the disadvantages of multiple methods far outweigh the disadvantages. Although qualitative and quantitative approaches are perceived to be from divergent and incompatible foundations, this study has provided empirical evidence that has demonstrated that multiple methods can be compatible and appropriate for complex and multifaceted studies such as the study of AKIS. The multiple paradigms, theories, methodologies and methods permitted the harnessing the strengths of the different approaches to provide comprehensive and well rounded data and understanding depending on which approach best

answered the research questions. A key lesson learned through this study is that multiple method research designs could lead to very large studies because the processes of data collection, analysis and writing up keep multiplying based on the number of methods used.

### **13.6.2 Contribution to the existing body of knowledge on AKIS**

This study shed light on the information behaviour of farmers and farmers' groups and revealed that most groups did not share information with other groups and community members. The non-sharing culture led to information asymmetries between groups, and between farmers belonging and not belonging to a group. Despite the challenges experienced by extension services, public extension officers were the chief source of agricultural information, followed by the private sector and neighbours. In addition to earlier findings (Rees *et al.* 2000; Garforth 2001a) on the AKIS being location-specific and enterprise specific, the present study revealed that the AKISs depended on actors who were present on the ground.

Among the many linkage mechanisms, this study demonstrated the importance of the Kirinyaga stakeholders' forum, partnerships between CSOs, farmers and the Ministry of Agriculture and the private sector, and local social networks such as "Community parliaments" as effective mechanisms that facilitated the flow of agricultural knowledge and information. Earlier AKIS studies have focused on extensionists. This was the first comprehensive study to explore the link between small-scale farmers' groups and knowledge management as well as information management in Kenya. Finally, the present study suggests an AKIS model, which builds upon the initial knowledge triangle model and other models to arrive at a flexible comprehensive AKIS model for small-scale farmers in Kirinyaga district that captures key actors, services, and communication and knowledge systems. The model was however not tested, as such testing lies beyond the scope of the present, already very large study.

### **13.6.3 Contribution to policy**

The findings of the present study have the potential to influence policy. The findings have provided policy direction to planners, policy makers and information providers on areas for policy development, reform and implementation in agriculture, extension services, social services, education, information and local knowledge, gender and ICTs as recommended above. In particular, the findings can contribute towards the implementation of the agriculture component of the Vision 2030, the new agricultural sector communication strategy, and guide the formulation of the recommended Kirinyaga district agricultural sector communication strategy. In addition, the findings will guide implementation, monitoring and evaluation of policy and agricultural programmes such as the draft ICT policy, NALEP, KAPP, ASPS and NAAIAP.

### **13.6.4 Contribution to practice**

Sekaran (2003:7,9), pointed out that the knowledge acquired through research may later be applied to solve problems. This study has provided a deeper understanding of various phenomena pertaining to the AKIS of small-scale farmers. Firstly, the study has elucidated the role of farmers' groups as key actors in an AKIS and their role in facilitating the flow of information among group members, as well as information asymmetries between groups due to the culture of not sharing with other groups and community members, and points to the need to encourage farmers to form groups. Secondly, the study has shed more light on the information needs and has identified information and knowledge that is required to satisfy the needs of small-scale farmers; behaviour and usage patterns of different categories of farmers in situation in space and time, and their feelings and emotions. Further, this study has highlighted the main types of information used for different purposes; the role of external and local knowledge, gaps in knowledge and information, missing and weak linkages as well as the quality of relationships among and between actors.

Thirdly, the study has crystallised understanding on group and individual decision making processes, learning and innovation, and has shown farmers preferred group decision making. Fourthly, the study has provided findings on farmers as users in totality including their feelings and emotions with regard to information behaviour and decision making in situation in space and time. The study has shown how the emotions farmers went through motivated / demotivated information seeking. Sixth, the findings on the key ICTs used and the challenges experienced with each channel shed more light on specific areas that radio, TV and cellular phones actors needed to improve and the need to exploit the potential of modern ICTs. Seventh, the findings of the present study lay emphasis on the need for a local knowledge audit, and the need to manage external information and local knowledge using conventional methods and knowledge management standards and techniques using a mix of traditional and modern communication channels. Eighth, it is hoped that the findings will be used for the development of systems that will be of value to small-scale farmers. Finally, lessons learned and the sharing of information and knowledge through the participatory methodology have pointed out immediate, short-term and long-term practical applications for strengthening linkages and improving the flow of knowledge and information.

The use of participatory methods allowed for the participation of farmers in their own development, and helped the actors participating in the study to identify practical areas in which they could intervene and improve the AKIS of Kirinyaga district, such as the need to use local knowledge and external information; to share information and knowledge with others, to join farmers' groups and to capture, document and share local knowledge. Comments under the concluding remarks by the key informants showed that the farmers and other actors had learned from participating in this study about the services and opportunities that they needed to exploit, and key actors such as extension

officers got an opportunity to assess some of their strengths and weaknesses in the provision of service.

In sum, this is the first comprehensive study to explore the link between small-scale farmers, farmers' groups and knowledge management, information management and ICTs in Kenya. In sum, the findings are important for several reasons. First, the findings and recommendations will contribute towards policy development, reforms and the implementation of policy, strategies and plans in agriculture, natural resources management, extension services, gender and social services, education, ICTs, climate change and global warming. Second, the study has provided a deeper understanding of the role that farmers' groups play as one of the key actors in an AKIS and the relationships among and between different actors. This will guide the underlying logic of interactions and the management of agricultural knowledge and information among small-scale farmers. It is anticipated that these findings will be used to improve access to agricultural knowledge, information, technology and innovation and translate to increased agricultural production and more earnings by small-scale farmers. Third, drawing on the earlier AKIS models, the study developed an AKIS model for small-scale farmers in Kirinyaga district. Fourth, the findings of this study have application to regional, pan-African and global commitments such as the PRSPs, Vision 2030's and MDGs, as well as other African countries and developing countries in general. Fifth, the study has provided empirical evidence that builds upon the existing body of knowledge of AKIS and farmers' groups, has made recommendations for strengthening linkages between actors, improving access to knowledge and information and managing agricultural information and knowledge (see **section 13.6**), and identified areas for further research. Finally, this large thesis will serve as a reference tool to students who have enrolled in the newly introduced Master of Science in AICM in Kenya and other Africa countries.

### **13.7 Suggestions for further research**

The study on the AKIS of small-scale farmers in Kirinyaga district was comprehensive and exhaustive and brought to light areas pertinent to an effective AKIS that required further investigation. This section highlights areas for further research.

- This study showed that there were information asymmetries between farmers groups, and between farmers belonging and not belonging to a group. Some farmers' groups did not share information and knowledge, and farmers belonging to a group had more access to information and knowledge than did farmers not belonging to a group. In addition, although some farmers shared local knowledge, there were no opportunities or networks for sharing. These findings point to the need to conduct further research on information asymmetries between farmers' groups, and between farmers belonging and not belonging to a group.
- Social networks of farmers were important channels for the sharing and exchange of agricultural information and knowledge (see **section 5.3.1.1.3** ). Further research on the role of social

networks and trust among members would provide a deeper understanding on the flow of agricultural information and knowledge between members of the network.

- The finding of the present study on different types of groups in Kirinyaga district, and that by Gotschi, Njuki and Delve (2009:276) that women who joined mixed groups benefitted more from the social capital in groups and improved access to information, services and contacts compared to those in female only groups point to the need for further research on a comparative study on the social capital derived from mixed, male only, female only and youth only groups and the ease with which the different types of groups accessed information and services from different sources.
- The very limited number of youth engaged in farming activities threatens the sustainability of agricultural development. Further research on the information behaviour of the youthful farmers would improve understanding on the type of information needs of the youth and how they go about looking for information to guide information providers in providing targeted information services and products to this critical category of users.
- Agricultural information and knowledge were important inputs in agricultural production. The present study looked into the information behaviour of users in specific situations, their feelings and emotions and outcome of using information. However, the finding of the present study showed that some farmers and farmers' groups did not seek information. Further investigation into the factors that motivate information seeking and the effects of emotions on information seeking behaviour would provide a deeper understanding of affective factors and why farmers seek or do not seek for information.
- There was under representation of women in decision making positions in farmers groups. Current research suggests that groups with a higher male: female ratio leadership were more successful in accessing market information than groups with a higher female: male ratio leadership (Barham and Chitemi 2009:57). According to Gotschi, Njuki and Delve (2009:273,275), male leaders in groups had better chances of accessing information than women. Further research on male and female leaders in groups and agricultural information seeking in general, as well as on accessing markets and market information would shed more light on the effect of gender on the success of groups in accessing information and markets and how best to enhance female leadership.
- The present study showed very low usage of existing market information systems such as KACE, Foodnet, and NAFIS. This finding suggests the need for further research on the usage of existing market information and the reasons for use or non-use.
- Farmers made different types of decisions, and while some were strategic, others were tactical, and operational. This study provided some understanding of the decision making processes of farmers' groups and individual farmers to guide communication efforts of information providers within the AKIS and provided some guidance on what information to repackage and how to repackage. An area for further research would be to investigate the different types of decisions

that farmers made, the sources of information they used, and the types of information and knowledge they used to facilitate decision making.

- This study showed that research and innovation was not an exclusive domain of researchers, and has shown that farmers and CSO actors contribute to innovation. The present study suggests the need for further research on innovation using the agricultural innovation system (AIS) framework, to shed more light on the innovation and learning processes of farmers.
- The present study showed that the cellular phone was among the top three preferred ICTs by small-scale farmers. Several innovative cellular phone applications have been developed for accessing and sharing agricultural and market information. Considering the versatility, pervasiveness and affordability of the cellular phone and its potential in communicating agricultural information among different actors in marginalised and unreached rural areas, an area for further research would be to examine the impact of cellular phones and other ICT applications on small-scale agriculture.
- Despite the low usage of modern ICTs for accessing agriculture and market information, it is recommended that further research be conducted on ICTs and the rural paradox. Studies have shown that farmers did not use ICTs even in places where there were good systems for farmers (Chisenga, Entsua-Mensah and Sam 2007:11). A study on why farmers do not exploit the potential of ICTs where infrastructure and systems for farmers are available would shed more light on how to improve the uptake of ICTs among small-scale farmers.
- The present study showed that there was limited activity in the management of agricultural information and local knowledge in rural areas and that there were very few resource centres. Further research on the impact of resource centres or digital villages equipped with skilled information officers on the delivery of agricultural information and knowledge to small-scale farmers would shed more light on the viability of rolling out digital villages in rural areas.
- The present study did not assess the variable awareness. Based on Röling's (2004:5) assertion that an AKIS will "hold promise that a set of complementary actors gel into a synergistic system once they begin to see themselves as a system," an area for further research would be to assess the level of awareness of the AKIS by actors of the system, and the complementary role(s) they each played.

### **13.8 In sum**

The study of AKISs in Kirinyaga district has provided an insight into the information behaviour of small-scale farmers. There were diverse and complementary actors providing agricultural information, but the information within the AKIS was not sufficient for the needs of small-scale farmers. The information needs and information behaviour were diverse, gender differentiated, and the AKISs in the district were complex, dynamic, and location specific. This study concludes that public extension officers were the cornerstone of the AKIS of small-scale farmers and private



extension services were a pillar of support for commercial farmers and services. However, the information service providers were few hence, extension officers were not easily accessible. Government thus needs to invest more in increasing and strengthening human capacity in extension services. Linkages between actors were mainly horizontal and were weak and uncoordinated. The suggested AKIS model for small-scale farmers in Kirinyaga district should go a long way towards improving agricultural development in Kirinyaga district.

It is time for a mind shift by farmers not belonging to a group, as farmers' groups are the gateway to agricultural knowledge and information, learning and innovation. Farmers' groups provide platforms that facilitate innovation, learning and interaction between farmers and key agricultural actors. However, farmers' groups need to be motivated and encouraged to share the knowledge and information assets of the group with other groups and members of the community to abate information asymmetries between groups, and between farmers belonging and not belonging to a group. The unabated migration of youth from rural to urban cities will be detrimental to attaining set goals and farming in the future. To ensure sustainability, the government of Kenya, and other African governments need to develop policies and strategies that motivate the youth, and provide incentives that attract youth to farming and to change the negative image of farming being an occupation of the poor and those who lack alternative opportunities.

Farmers preferred oral face-to-face people-based communication channels, and the usage of ICTs, and in particular modern ICTs for sharing and accessing information and knowledge was low. Considering the investment in information systems developed for farmers, and the high investment in ICT and rural electrification infrastructure in Kenya, there is a need for ICT literacy for farmers in order to harness the benefits of ICTs, particularly the cellular phone in accessing and sharing knowledge and information and in finding markets and better prices. This study showed that farmers needed both external agricultural information and local knowledge, hence information providers need to avail the two knowledge systems to farmers. Provision of information services need to be done along gender lines, using the communication channels preferred by male, female and youth farmers. The information and knowledge management practices used in Kirinyaga district were not sufficient to improve access to agricultural information and knowledge for the wider community and there was a need for adopt conventional information management and knowledge management and ICTs. In conclusion, the study realised the purpose of understanding small-scale farmers as key actors of the AKIS of small-scale farmers in Kirinyaga district, and has contributed to the existing body of knowledge on paradigms, theories, methodologies and AKIS of small-scale farmers and to policy and practice. Recommendations have been suggested for improving the AKIS of Kirinyaga district and areas for further research have been highlighted.

# REFERENCES

## Abbreviations of references used

ACDI/VOCA	see	Agricultural Cooperative Development International and Volunteers in Overseas Cooperative Assistance
AERC	see	African Economic Research Consortium
ASARECA		Association for Strengthening African Agricultural Research in Eastern and Central Africa
AU	see	African Union
CEDAW		Convention on the Elimination of all forms of Discrimination Against Women
CIA	see	Central Intelligence Agency of the United States
CIARD	see	Coherence in Information for Agricultural Research for Development
CIMMYT	see	International Maize and Wheat Improvement Centre
CTA		Technical Centre for Agricultural and Rural Cooperation
FAO	see	Food and Agriculture Organization of the United Nations
FIDA	see	Federation of Women Lawyers
GoK	see	Government of Kenya
GB	see	Great Britain
ICIPE	see	International Centre for Insect Physiology and Ecology
ICRAF	see	World Agroforestry Centre
ICSU	see	International Council for Science
IDRC	see	International Development Research Centre
IDS	see	Institute of Development Studies
IFAD	see	International Fund for Agricultural Development
IFLA		International Federation of Library Associations and Institutions
IFPRI		International Food Policy Research Institute
IIED	see	International Institute for Development
IIRR	see	International Institute of Rural Reconstruction
IITA	see	International Institute for Tropical Agriculture
ILEIA	see	Information on Low-External-Input and Sustainable Agriculture
ILRI	see	International Livestock Research Institute
INASP	see	International Network for the Availability of Scientific Publications
ISNAR	see	International Service for National Agricultural Research
ITU	see	International Telecommunications Union
KACE	see	Kenya Agricultural Commodity Exchange
KAINet	see	Kenya Agricultural Information Network
KAPAP	see	Kenya Agricultural Productivity and Agribusiness Project
KARI	see	Kenya Agricultural Research Institute
KIT	see	Royal Tropical Institute
KNBS	see	Kenya National Bureau of Statistics
LEISA	see	Low-External-Input and Sustainable Agriculture
MDGs	see	Millennium Development Goals
NAADS	see	National Agricultural Advisory Services
NALEP	see	National Agricultural and Livestock Extension Programme
NESC	see	National Economic and Social Council of Kenya
ODI	see	Overseas Development Institute

OECD	see	Organisation for Economic Co-operation and Development
PROLINNOVA	see	Promoting Local Innovation
RoK	see	Republic of Kenya
RUFORUM	see	Regional Universities Forum for Capacity Building in Agriculture
UK	see	United Kingdom
UKZN	see	University of KwaZulu-Natal
UN	see	United Nations
UNECA	see	United Nations Economic Commission for Africa
UNESCO	see	United Nations Educational, Scientific and Cultural Organization

- Abagi, O.** 1995. Understanding social science research: an overview of the nature and function of educational research. In: Mwiria, K. and S. P. Wamahiu. (eds). *Issues in educational research in Africa*. Nairobi: East African Educational Publishers. pp. 12-26.
- Abbott, M. A.** 1989. Towards an understanding of the meaning of the word use in the phrase “use of literature.” M. Sc. thesis. Pietermaritzburg: University of Natal.
- Abdullah, M. S., C. Kimble., I. Benest and R. Paige.** 2006. Knowledge-based systems: a re-evaluation. *Journal of Knowledge Management* 10(3):127-142.
- Abegunde, A. A.** 2009. The role of community based organisations in economic development in Nigeria: the case of Oshogbo, Osun State, Nigeria. *The International NGO Journal* 4(5):236-252.
- Abid, A.** 1995. Keynote address: Meeting the information needs of rural communities. In: Johansson, E. (ed.) *Seminar on information provision to rural communities in Africa*. Proceedings of the seminar held in Gaborone, Botswana, 22-25 June 1994. Uppsala: IFLA. pp. 11-16.
- Adedipe, N. O., P. A. Okunye and I. A. Ayinde.** 2004. The relevance of local and indigenous knowledge for Nigerian agriculture. Paper presented at the International Conference on Bridging Scales and Epistemologies: Linking Local Knowledge with Global Science in Multi-scale Assessments, 16-19 March 2004, Alexandria, Egypt.
- Adegbite, D. A.** 2009. Repayment performance of beneficiaries of Ogun State Agricultural and Multi-purpose Credit Agency (Osamca) in Ogun State, Nigeria (2004-2007). *American Eurasian Network for Scientific Information* 3(1):117-125.
- Adenso-Okyere, K., K. Davis and D. Aredo.** 2008. *Advancing agriculture in developing countries through knowledge and innovation: synopsis of an international conference*. Washington: IFPRI.
- Adesina, A. A.** 2009. Africa’s food crisis: conditioning trends and global development policy. Keynote paper presented at the International Association of Agricultural Economists Conference, Beijing, China, 16 August 2009. <[http://www.aaae-africa.org/IAAE-conference-paper-Akin-august-16-2009\(3\).pdf](http://www.aaae-africa.org/IAAE-conference-paper-Akin-august-16-2009(3).pdf)> 27 March 2010.
- Adimorah, E. N. O.** 1995. An overview of the state of information provision to rural communities in Anglophone West Africa. In: Johansson, E. (ed.) *Seminar on information provision to rural communities in Africa*. Proceedings of the seminar held in Gaborone, Botswana, 22-25 June 1994. Uppsala: IFLA. pp. 21-31.
- Adomi, E. E., M. O. Ogbomo and O. E. Inoni.** 2003. Gender factor in crop farmers’ access to agricultural information in rural areas of Delta State, Nigeria. *Library Review* 52(8):388-393.
- Agrawal, A.** 2004. Indigenous and scientific knowledge: some critical comments. *IK Monitor* 3(3) <[http://www-personal.umich.edu/~arunagra/papers/IK%20Monitor%203\(3\)%20Agrawal.pdf](http://www-personal.umich.edu/~arunagra/papers/IK%20Monitor%203(3)%20Agrawal.pdf)> 12 June 2008.
- Agricultural Cooperative Development International and Volunteers in Overseas Cooperative Assistance (ACDI/VOCA).** 2009. Smallholder horticulture outgrower promotion (SHOP) project. USAID Cooperative Agreement no. 621-A-00-08-00001-00. Final SHOP project report. <[http://pdf.usaid.gov/pdf\\_docs/PDACO768.pdf](http://pdf.usaid.gov/pdf_docs/PDACO768.pdf)> 30 April 2010.
- Agwu, A. E., M. U. Dimelu and M. C. Madukwe.** 2008. Innovation system approach to agricultural development: policy implications for agricultural extension delivery in Nigeria. *African Journal of Biotechnology* 7(11):1604-1611.

- Ahmed, S. M. Z.** 2009. The boat library of Bangprok community in Thailand: an evaluation of its performance and impact. *New Library World* 110(11/12):498-511.
- Aikenhead, G.** 2001. Integrating western and aboriginal sciences: cross-cultural science teaching. *Research in Science Education* 31:337-355.
- Aina, L. O.** 1990. Informing African farmers: some obstacles to information flow. *Information Development* 6(4):201-203.
- Aina, L. O.** 1995. Information and agriculture in Africa. In: Aina, L. O., A. M. Kaniki, and J. B. Ojiambo (eds). *Agricultural information in Africa*. Ibadan: Third World Information Services. pp. 1-11.
- Aina, L. O.** 2007. Globalisation and small-scale farming in Africa: what role for information centres? Paper presented at the World Library and Information Congress: 73rd IFLA General Conference and Council, 19-23 August 2007, Durban, South Africa.
- Aina, L. O., A. M. Kaniki and J. B. Ojiambo** (eds). 1995. *Agricultural information in Africa*. Ibadan: Third World Information Services.
- Aitchison, J.** 2006. Experiments in the provision of rural community libraries in South Africa: the Family Literacy Project's initiatives. *Innovation* 32:94-109.
- Akers, R. L., M. D. Krohn, L. Lanza-Kaduce and M. Radosevich.** 1979. Social learning and deviant behavior: a specific test of a general theory. *American Sociological Review* 44(4):636-655.
- Alavi, M. and A. Tiwana.** 2002. Knowledge integration in virtual teams: the potential role of KMS. *Journal of the American Society for Information Science and Technology* 53(12):1029-1037.
- Alavi, M. and D. E. Leidner.** 2001. Review: knowledge management and knowledge management systems: conceptual foundations and research issues. *MIS Quarterly* 25(1):107-136.
- Alders, C., B. Haverkort and L. Van Veldhuizen** (eds). 1993. *Linking with farmers: networking for low-external-input and sustainable agriculture*. London: Intermediate Technology Publications.
- Alemna, A. A.** 1995. Agricultural information services in West Africa. In: Aina, L. O., A. M. Kaniki and J. B. Ojiambo (eds). *Agricultural information in Africa*. Ibadan: Third World Information Services. pp. 67-82.
- Alene, A. D. and V. M. Manyong.** 2007. The effects of education on agricultural productivity under traditional and improved technology in northern Nigeria: an endogenous switching regression analysis. *Empirical Economics* 32:141-159.
- Alex, G., W. Zijp, D. Byerlee and the AKIS Thematic Team.** 2002. *Rural extension and advisory services: new directions*. World Bank Agriculture and Rural Development Rural Development Strategy background paper no. 9. Washington: The World Bank.
- Alila, P. O. and R. Atieno.** 2006. Agriculture policy in Kenya: issues and processes. A paper for the Future Agricultures Consortium workshop, IDS, 20-22 March 2006. <[http://www.future-agricultures.org/pdf%20files/Ag\\_policy\\_Kenya.pdf](http://www.future-agricultures.org/pdf%20files/Ag_policy_Kenya.pdf)> 15 April 2010.
- Allan, G.** 2003. A critique of using grounded theory as a research method. *Electronic Journal of Business Research Methods* 2(1):1-10.
- Allen, W., O. Bosch, M. Kilvington, J. Oliver and M. Gilbert.** 2001. Benefits of collaborative learning for environmental management: applying the integrated systems for knowledge management approach to support animal pest control. *Environmental Management* 27(2):215-223.
- Amudavi, D. M., Z. R. Khan, J. M. Wanyama, C. A. O. Midega, K. Pittchar, A. Hassanali and J. A. Pickett.** 2009. Evaluation of farmers' field days as a dissemination tool for push-pull technology in Western Kenya. *Crop Protection* 28:225-235.
- Anderson, J. R.** 1999. Institutional reforms for getting an agricultural knowledge system to play its role in economic growth. *The Pakistan Development Review* 38(4):333-354.
- Anderson, J. R. and G. Feder.** 2004. Agricultural extension: good intentions and hard realities. *The World Bank Research Observer* 19(1):41-60.
- Anderson, P.** 1999. Complexity theory and organization science. *Organization Science* 10(3):216-232.
- Andima, D. K., J. Ndubi, M. Kamau, F. Ndungu, D. J. Rees and C. Nkonge.** 1999. Characterization and evaluation of uptake pathways and agricultural knowledge and information systems in Trans-Nzoia and West Pokot districts. In: Sutherland, J. A. (ed.) *Towards increased use of demand driven technology*. Pre-conference mini-papers prepared for the KARI/DFID NARP II Project. End of Project Conference, 23-26 March 1999, Nairobi Kenya. pp. 585-587.

- Andrew, A. M.** 2004. Questions about constructivism. *Kybernetes* 33(9):1392-1395.
- Asaba, J. F., R. Musebe, M. Kimani, R. Day, M. Nkonu, A. Mukhebi, A. Wesonga, R. Mbula, P. Balaba and A. Nakagwa.** 2006. Bridging the information and knowledge gap between urban and rural communities through rural knowledge centres: case studies from Kenya and Uganda. *IAALD Quarterly Bulletin* LI(3/4):143-151.
- Asingwire, N.** 2003. End of term evaluation report. Electronic delivery of agricultural information (EDAI) to rural communities in Uganda. Project no. 100206.
- Asopa, V. N. and G. Beye.** 1997a. Proposed approaches in managing linkages between agricultural research and extension. In: Swanson, B. E., R. P. Bentz and A. J. Sofranko. (eds). *Improving agricultural extension: manual*. Rome: FAO.  
<<http://www.fao.org/docrep/W5830E/w5830e00.HTM>> 18 October 2007.
- Asopa, V. N. and G. Beye.** 1997b. Module 8. Research-extension linkage. In: Asopa, V. N. and G. Beye. *Management of agricultural research: a training manual*. Rome: FAO.  
<<http://www.fao.org/docrep/W7508E/w7508e00.HTM>> 18 October 2007.
- Attias, L. and J. Deflander.** 2003. The information highways are still unpaved: the internet and West African community radio. In: Girard, B. (ed.) *The one to watch: radio, new ICTs and interactivity*. Rome: FAO. pp. 57-68.
- Aubrac, R.** 1997. Information science and food production in developing countries. *Bulletin of the American Society for Information Science* 3(3):19-20.
- Awad, E. M. and H. M. Ghaziri.** 2004. *Knowledge management*. New Jersey: Pearson Prentice Hall.
- Babbie, E.** 2004. *The practice of social research*. 10th ed. Belmont: Wadsworth.
- Babbie, E. and J. Mouton.** 2001. *The practice of social research*. Oxford: Oxford University Press.
- Bachelor, S., N. Hafkin and A. Chéneau-Loquay.** 2005. External review: program initiative – Acacia II 2001-2005. <<http://idrinfor.ca/archive/Corpdocs/122115/39236-39238.pdf>> 19 March 2008.
- Bachmann, L. B. R.** 2000. Review of the agricultural knowledge system in Fiji: opportunities and limitations of participatory methods and platforms to promote innovation development. Doctor Rerum Agricultrarum Dissertation. Berlin: Humboldt-Universität.
- Backus, G. B. C., V. R. Eidman and A. A. Dijkhuizen.** 1997. Farm decision making under risk and uncertainty. *Netherlands Journal of Agricultural Science* 45:307-328.
- Bagnall-Oakeley, H. and M. Ocilaje.** 2002. Development of procedures for the assessment and management by farmers of their agricultural information networks and needs at the sub-county level in Uganda. AKIS study report. Client Oriented Agricultural Research and Dissemination Project.  
<<http://www.naro.go.ug/Information/COARD%20Project%20Documentation/Knowledge%20Systems/AKIS%20study.pdf>> 12 June 2007.
- Bagnall-Oakeley, H., M. Ocilaje, F. Oumo, N. Nangoti, L. Oruko and D. Rees.** 2004. Mapping and understanding farmers indigenous agricultural knowledge and information systems and the implications for contracted research and extension. *Uganda Journal of Agricultural Sciences* 9:119-125.
- Baird, L., S. Deacon and P. Holland.** 2000. From action learning to learning from action: implementing the after action review. In: Cross, R. L. and S. B. Israelit (eds). *Strategic learning in a knowledge economy: individual, collective and organisational learning process*. Woburn MA: Butterworth-Heinemann. pp. 185-202.
- Baker, L. M.** 2006. Observation: a complex research method. *Library Trends* 55(1):171-189.
- Baker, P. S., J. Bentley, C. Charveriat, H. Duque, J. Lefroy and H. M. Munyua.** 2001. The coffee smallholder. In: Baker, P. S. (ed.) *Coffee futures: a source book of some critical issues confronting the coffee industry*. Egham: CABI Commodities. pp. 26-43.
- Ballantyne, P.** 2005. Accessing and managing agricultural information. INASP Newsletter, no. 28, March.
- Bandura, A.** 1977. *Social learning theory*. Englewood Cliffs: Prentice Hall.
- Bandura A.** 2007. Albert Bandura: biographical sketch.  
<<http://www.des.emory.edu/mfp/bandurabio.html>> 17 May 2010.
- Barbour, R. S. and J. Schostak.** 2005. Interviewing and focus groups. In: Somekh, B. and C. Lewin. (eds). *Research methods in the social sciences*. London: Sage Publications. pp. 41-48.



- Barham, J. and C. Chitemi.** 2009. Collective action initiatives to improve marketing performance: lessons from farmer groups in Tanzania. *Food Policy* 34:53-59.
- Barkhi, R., V. S. Jacob, L. Pipino and H. Pirkul.** 1998. A study of the effect of communication channel and authority on group decision processes and outcomes. *Decision Support Systems* 23:205-226.
- Bates, M. J.** 2005. An introduction to metatheories, theories and models. In: Fisher, K. E., S. Erdelez and L. E. F. McKechnie. (eds). *Theories of information behavior*. (ASIST Monograph). Medford: Information Today. pp. 1-24.
- Baur, H. and C. Kradi** 2001. Integrating participatory research methods in public agricultural research organisation: a partially successful experience in Morocco. Agricultural Research and Extension Network (AgREN) Paper no. 109. London: ODI.
- Bawden, D.** 2006. Users, user studies and human information behaviour: a three-decade perspective on Tom Wilson's "On user studies and information needs." *Journal of Documentation* 62(6):671-679.
- Bay-Petersen, J.** 1985. Agricultural research to help the small-scale farmer in developing countries. <<http://www.agnet.org/library/eb/222b/>> 3 February 2008.
- Bazeley, P.** 2007. *Qualitative data analysis with NVivo*. 2nd ed. London: Sage Publications.
- Bebbington, A.** 2002. Social capital / social development / SDV. Paper prepared for the workshop: Social capital: the value of the concept and strategic directions for World Bank lending. IFC, Washington DC, 1 March 2002.
- Beins, B. C.** 2004. *Research methods: a tool for life*. Boston: Pearson.
- Belkin, N. J.** 2005. Anomalous state of knowledge. In: Fisher, K. E., S. Erdelez and L. E. F. McKechnie. (eds). *Theories of information behaviour* (ASIST Monograph). Medford: Information Today. pp. 44-48.
- Belkin, N. J., R. N. Oddy and H. M. Brooks.** 1982. ASK for information retrieval: part 1. Background and theory. *Journal of Documentation* 38(2):61-71.
- Bell, J.** 1987. *Doing your research project: a guide for first-time researchers in education and social science*. Milton Keynes: Open University Press.
- Bellon, M. R.** 2001. *Participatory research methods for technology evaluation: a manual for scientists working with farmers*. Mexico: CIMMYT.
- Bembridge, T. J. and K. A. Tshikolomo.** 1998. Communication and decision making among fruit growers in the Phaswana area of Northern Province. *South African Journal of Agricultural Extension* 27:19-29.
- Benbya, H. and B. McKelvey.** 2006. Toward a complexity theory of information systems development. *Information Technology and People* 19(1):12-34.
- Benjamin, P.** 1999. Community development and democratisation through information technology: building the new South Africa. In: Heeks, R. (ed.) *Reinventing government in the information age: international practice in IT-enabled public sector reform*. London: Routledge. pp. 194-210.
- Benjamin, P.** 2001. The Gaseleka telecentre, Northern Province, South Africa. In: Latchem, C. and D. Walker. (eds). *Perspectives on distance education telecentres: case studies and key issues*. Vancouver: The Commonwealth of Learning. pp. 75-84.  
<<http://www.col.org/telecentres/chapter%2007.pdf>> 15 July 2007.
- Benzie, D., D. Mavers, B. Somekh and E. J. Cisneros-Cohernour.** 2005. Communities of practice. In: Somekh, B. and C. Lewin. (eds). *Research methods in the social sciences*. London: Sage Publications. pp. 180-187.
- Berdegú, J. A.** 2005. *Pro-poor innovation systems*. Rome: IFAD.  
<<http://www.ifad.org/events/gc/29/panel/e/julio.pdf>> 25 March 2008.
- Berdegú, J. A. and G. Escobar.** 2001. Agricultural knowledge and information systems and poverty reduction.  
<<http://www.rimisp.org/FCKeditor/UserFiles/File/documentos/docs/pdf/0115-000824-akisandpovertyrevisedfinal.pdf>> 18 October 2007.
- Berdegú, J. A. and G. Escobar.** 2002. Rural diversity, agricultural innovation policies and poverty reduction. Agricultural Research and Extension Network (AgREN) Paper no. 122. London: ODI.
- Bergeron, B.** 2003. *Essentials of knowledge management*. New Jersey: John Wiley and Sons.

- Bergman, M. M.** 2008a. The straw men of the qualitative-quantitative divide and their influence on mixed methods research. In: Bergman, M. M. (ed.) *Advances in mixed methods research*. Los Angeles: Sage Publications. pp. 11-21.
- Bergman, M. M.** 2008b. Introduction: wither mixed methods. In: Bergman, M. M. (ed.) *Advances in mixed methods research*. Los Angeles: Sage Publications. pp. 1-7.
- Bergman, M. M.** 2008c. Combining different types of data for quantitative analysis. In: Alasuutari, P., L. Bickman and J. Brannen. (eds). *The SAGE handbook of social research methods*. Los Angeles: Sage Publications. pp. 585-601.
- Bernard, T. and D. J. Spielman.** 2009. Reaching the rural poor through rural producer organisations? A study of agricultural marketing cooperatives in Ethiopia. *Food Policy* 34:60-69.
- Bertolini, R.** 2004. Strategic thinking: making information and communication technologies work for food security in Africa. <<http://www.ifpri.org/pubs/ib/ib27.pdf>> 6 September 2007.
- Best, J., S. White, S. Abeyasekera, E. Huda and P. Norrish.** 2005. Natural Resources Systems Programme Project R8083. Strengthened rural services for improved livelihoods in Bangladesh. Final technical report Annex A: Knowledge, information and livelihood opportunities for rural poor in Bangladesh. <<http://www.nrsp.org/database/documents/2520.pdf>> 12 June 2007.
- Bhana, A.** 2006. Participatory action research: a practical guide for realistic radicals. In: Terre Blanche, M., K. Durrheim and D. Painter. (eds). *Research in practice: applied methods for the social sciences*. 2nd ed. Cape Town: University of Cape Town. pp. 429-442.
- Biggiero, L.** 2007. Organizations as cognitive systems: what do they process and deliver? MPRA Paper no. 3137. <<http://mpa.ub.uni-muenchen.de/3137/>> 24 February 2008.
- Biggs, S. D. and H. Matsuert.** 2004. Strengthening poverty reduction programmes using an actor-oriented approach: examples from natural resources innovations systems. Agricultural Research and Extension Network (AgREN) Paper no. 134. London: ODI.
- Binder, A.** 1972. "A new context for psychology: social ecology." *American Psychologist* 27:903-908.
- Bingen, J., A. Serrano and J. Howard.** 2003. Linking farmers to markets: different approaches to human capital development. *Food Policy* 28:404-419.
- Birkinshaw, J. and T. Sheehan.** 2002. Managing the knowledge life cycle. *MIT Sloan Management Review* 44(1):75-83.
- Blaikie, N. W. J.** 1991. A critique of the use of triangulation in social research. *Quality and Quantity* 25(2):115-136.
- Blaxter, L., C. Hughes and M. Tight.** 2006. *How to research*. 3rd. ed. Maidenhead: Open University.
- Blumberg, R. L.** 1992. African women in agriculture: farmers, students, extension agents, chiefs. Development Studies Paper. Morrilton: Winrock International Institute for Agricultural Development.
- Bobbili, R., M. Luczynska, S. Miyagawa and M. Gaudi.** 2006. Radio farm forum and Afronet: learning from successful ICT projects in Zambia. <<http://ocw.mit.edu/NR/rdonlyres/Foreign-Languages-and-Literatures/21F-034Fall-2005/3D2F9026-BCDE-408A-A10B-488C73A9CEAE/0/zambianscs.pdf>> 12 July 2007.
- Bodhanya, S.** 2008. Knowledge management: from management fad to systemic change. In: Abou-Zeid, E-S. (ed.) *Knowledge management and business strategies: theoretical frameworks and empirical research*. New York: Information Science Reference.
- Boisot, M. H.** 1998. *Knowledge assets: securing competitive advantage in the information economy*. Oxford: Oxford University Press.
- Bokhari, R. H.** 2005. The relationship between system usage and user satisfaction: a meta-analysis. *Journal of Enterprise Information Management* 18(2):211-234.
- Boonekamp, G. M. M., M. D. Gutierrez-Sigler, C. Colomer and H. W. Vaan Dragar.** 1996. Opportunities for health promotion: the knowledge and information system of the Valecian food sector, Spain. *Health Promotion International* 11(4):309-319.
- Boonyaguakul, P. and S. Wapet.** 2005. Role of farmers and their organization in providing agriculture information for networking systems: case of Thailand. Paper presented to Seminar on Networking of the Agricultural Technology and Transfer and Training, 28th November – 1st December, 2005, Jakarta and Bogor, Indonesia.
- Borgman, C. L.** 2008. From knowledge to data to knowledge: expanding the horizons of information studies. In: Huotari, M-J. and E. Davenport. (eds). *From information provision to*

- knowledge production*. Proceedings of the international conference for the celebration of the 20<sup>th</sup> anniversary of Information Studies, Faculty of Humanities, University of Oulu, Finland, June 23-25, 2008 Oulu: University of Oulu. pp. 15-36
- Bouthillier, F. and K. Shearer.** 2002. Understanding knowledge management and information management: the need for an empirical perspective. *Information Research* 8(1).  
<<http://InformationR.net/ir/8-1/paper141.html>> 28 March 2007.
- Bovaird, J. and S. E. Embretson.** 2008. Modern measurement in the social sciences. In: Alasuutari, P., L. Bickman and J. Brannen. (eds). *The SAGE handbook of social research methods*. Los Angeles: Sage Publications. pp. 269-289.
- Brannen, J.** 2008. The practice of a mixed methods research strategy: personal, professional and project considerations. In: Bergman, M. M. (ed.) *Advances in mixed methods research*. Los Angeles: Sage Publications. pp. 53-65.
- Braun, A. R., G. Thiele and M. Fernández.** 2000. Farmer field schools and the local agricultural research committees: complementary platforms for integrated decision making in sustainable agriculture. Agricultural Research and Extension Network (AgREN) paper no. 105. London: ODI.
- Braun, A. R., J. R. Okoth, H. Khaamal and G. S. Khisa.** 2007. Building FFS networks in East Africa. *LEISA Magazine* 23(1):18-19.
- Breidlid, A.** 2009. Culture, indigenous knowledge systems and sustainable development: a critical view of education in an African context. *International Journal of Educational Development* 29:140-148.
- Briggs, J.** 2005. The use of indigenous knowledge in development: problems and challenges. *Progress in Development Studies* 5(2):99-114.
- Briggs, R. O., G-J. de Vreede, J. F. Nunamaker and R. H. Sprague.** 2003. Special issue: information systems success. *Journal of Management Information Systems* 19(4):5-8.
- Bringe, F.** 2008. *Knowledge powers rural development: overview of concepts and cases worldwide*. Eschborn: GTZ.
- Britz, J. J.** 2007. The joy of sharing knowledge: but what if there is no knowledge to share? A critical reflection on human capacity building in Africa. *International Review of Information Ethics* 7(09):18-28. <[http://www.i-r-i-e.net/inhalt/007/irie\\_007\\_full.pdf](http://www.i-r-i-e.net/inhalt/007/irie_007_full.pdf)> 26 January 2010.
- Brokensha, D., D. Warren, and O. Werner** (eds). 1980. *Indigenous knowledge systems and development*. Lanham: University Press of America.
- Brooks, K.** 2006. Keynote speech: Agricultural research as champion of change. In: *Proceedings of the 9th KARI Biennial Scientific Conference. Theme: Agricultural research for improved productivity and livelihoods*. 8-12 November 2004. Nairobi: KARI. pp. xxv-xxvi.
- Brown, J. and P. Sice.** 2005. Towards a second order research methodology. *Journal of Business Research Methodology* 3(1):25-36.
- Bruner, J.** 1990. *Acts of meaning*. Cambridge: Harvard University Press.
- Bryman, A.** 2004. *Social research methods*. 2nd ed. Oxford: Oxford University Press.
- Bryman, A.** 2006. Integrating quantitative and qualitative research: how is it done? *Qualitative Research* 6(1):97-113.
- Bryman, A.** 2008a. Why do researchers integrate / combine / mesh / blend / mix / merge / fuse quantitative and qualitative research? In: Bergman, M. M. (ed.) *Advances in mixed methods research*. Los Angeles: Sage Publications. pp. 87-100.
- Bryman, A.** 2008b. The end of the paradigm wars. In: Alasuutari, P., L. Bickman and J. Brannen. (eds). *The SAGE handbook of social research methods*. Los Angeles: Sage Publications. pp. 13-25.
- Bryman, A. and E. Bell.** 2003. *Business research methods*. Oxford: Oxford University Press.
- Buchanan-Smith, M., S. Davies and C. Petty.** 1994. Food security: let them eat information. *IDS Bulletin* 25(2):69-80.
- Bunders, J. F. G. and J. E. W. Broerse** (eds). 1991. *Appropriate biotechnology in small-scale agriculture: how to reorient research and development*. Wallingford: CAB International.
- Byrne, M. M.** 2001. Linking philosophy, methodology and methods in qualitative research. *AORN Journal* 73(1):207-209.



- Byamugisha, H. M., R. Ikoja-Odongo, G. W. Nasinyama and S. Lwasa.** 2008. Information seeking and use among urban farmers in Kampala district. *Agricultural Information Worldwide* 1(3):94-101.
- Caffentzis, G.** 2010. Hoisting the “knowledge bank” on its own petard: the World Bank and the double crisis of African universities. *Edufactory Web Journal* January 2010. <<http://abahlali.org/files/Caffentzis.doublecrisis.pdf>> 29 March 2010.
- Camble, E.** 1994. The information environment for rural development workers in Borno State, Nigeria. *African Journal of Library, Archives and Information Science* 4(2):99-106.
- Cameron, A.** 2007. Farmers’ markets as small business incubators and safety nets: evidence from New Zealand. *International Journal of Entrepreneurial Behaviour and Research* 13(6):367-379.
- Campbell, D. J.** 1999. Response to drought among farmers and herders in Southern Kajiado district, Kenya: a comparison of 1972-1976 and 1994-1995. *Human Ecology* 27(3):377-416.
- Carrasco, E. A.** 2001. The role of extension in the Cuban agricultural knowledge and information system: the case of Havana City Province. PhD. diss. Iowa: Iowa State University. (Abstract and preliminary pages).
- Carver, R. H. and J. G. Nash.** 2009. *Doing data analysis with SPSS version 16*. Belmont: Brooks / Cole, Cengage Learning.
- Case, D. O.** 2002. *Looking for information: a survey of research on information seeking, needs and behaviour*. Amsterdam: Elsevier.
- Case, D. O.** 2005. Principle of least effort. In: Fisher, K. E., S. Erdelez and L. E. F. McKechnie. (eds). *Theories of information behavior*. (ASIST Monograph). Medford: Information Today. pp. 289-297.
- Case, D. O.** 2007. *Looking for information: a survey of research on information seeking, needs and behaviour*. 2nd ed. Amsterdam: Elsevier.
- Castillo, A.** 2000. Ecological information system: analyzing the communication and utilization of scientific information in Mexico. *Environmental Management* 25(4):383-392.
- Castillo, G. T.** 1998. A social harvest reaped from a promise of springtime: user-responsive, participatory agricultural research in Asia. In: Röling, N. G. and M. A. E. Wagemakers. (eds). *Facilitating sustainable agriculture: participatory learning and adaptive management in times of environmental uncertainty*. Cambridge: Cambridge University Press. pp. 191-213.
- Catts, R. and J. Lau.** 2008. Towards information literacy indicators: conceptual framework paper. Paris: UNESCO. <<http://unesdoc.unesco.org/images/0015/001587/158723e.pdf>> 28 April 2008.
- Central Intelligence Agency of the United States (CIA).** 2004. The world factbook – Kenya <<https://www.cia.gov/library/publications/the-world-factbook/print/ke.html>> 8 November 2007.
- Central Intelligence Agency of the United States (CIA).** 2007. The world factbook – Kenya <<https://www.cia.gov/library/publications/the-world-factbook/print/ke.html>> 8 November 2007.
- Central Intelligence Agency of the United States (CIA).** 2010. The world factbook – Kenya <<https://www.cia.gov/library/publications/the-world-factbook/geos/ke.html>> 3 March 2010.
- Chaka, M. P.** 2003. The usability and effectiveness of a printed information booklet: a survey amongst small-scale rural farmers. M.A. thesis. Pretoria: University of Pretoria.
- Chamala, S. and P. M. Shingi.** 1997. Establishing and strengthening farmer organizations. In: Swanson, B. E., R. P. Bentz and A. J. Sofranko (eds). *Improving agricultural extension: a reference manual*. Rome: FAO. <<http://www.fao.org/docrep/W5830E/w5830e0n.htm>> 6 April 2008.
- Chambers, R.** 1994. Foreword. In: Scoones, I. and J. Thompson. (eds). *Beyond farmer first: rural people’s knowledge, agricultural research and extension practice*. London: IIED. pp. xiii-xvi.
- Chambers, R.** 1998. Foreword. In: Holland, J. and J. Blackburn. *Whose voice? Participatory research and policy change*. Warwickshire: Intermediate Technology Publications. pp. xv-xviii.
- Chambo, S. A.** 2009. Agricultural co-operatives: role in food security and rural development. Paper presented to Expert Group Meeting on Co-operatives, held on 28-30 April 2009, New York.
- Chan, C. G. and G. H. Elder Jr.** 2001. Family influences on the social participation of youth: the effects of parental social involvement and farming. *Rural Sociology* 66(1):22-42.

- Chapman, R., R. Blench, K. Gordana, and A. B. T. Zakariah.** 2003. Rural radio in agricultural extension: the example of vernacular radio programmes on soil and water conservation in northern Ghana. Agricultural Research and Extension Network (AgREN) Paper no. 127. London: ODI.
- Chapman, R. and R. Tripp.** 2003. Changing incentives for agricultural extension – a review of privatised extension in practice. Agricultural Research and Extension Network (AgREN) Network Paper no. 132. London: ODI.
- Chapman, R. and T. Slaymaker.** 2002. ICTs and rural development: review of the literature, current interventions and opportunities for action. ODI Working Paper 192. London: ODI.
- Chatfield, C.** 1988. *Problem solving: a statistician's guide*. London: Chapman and Hall.
- Chau, N. M., S. Wei, V. T. Truyen, M. Rankins and I. Russel.** 2004. Getting farmers to work together: the experiences of mango growers in the Mekong Delta region of Vietnam. In: Johnson, G. I. and P. J. Hofman. (eds). *Agriproduct supply-chain management in developing countries*. ACIAR Proceedings no. 119e. Proceedings of a workshop held in Bali, Indonesia, 19-22 August 2003. Canberra: ACIAR. pp. 107-111.
- Checkland, P.** 1988. Information systems and systems thinking: time to unite? Second annual Rank Xerox lecture of the Worshipful Company of Chartered Secretaries and Administrators, delivered at City University, UK. 2 March 1988. In: Checkland, P. and J. Scholes. 1999. *Soft systems methodology in action*. Chichester: John Wiley and Sons Ltd. pp. 303-315. First published in *International Journal of Information Management* Vol. 8, 1988, pp. 239:248.
- Checkland, P.** 1999. *Soft systems methodology: a 30-year retrospective*. Chichester: John Wiley and Sons.
- Checkland, P.** 2000. Soft systems methodology: a thirty year retrospective. *Systems Research and Behavioural Science* 17:s11-s58.
- Checkland, P. and J. Scholes.** 1990. *Soft systems methodology in action*. Chichester: John Wiley and Sons.
- Checkland, P. and J. Scholes.** 1999. *Soft systems methodology in action*. Chichester: John Wiley and Sons.
- Chepsaigutt, K. K.** 1997. An overview of agricultural extension activities in Rift Valley. In: Rees, D. J., C. Nkonge and J. L. Wandera. (eds). *A review of agricultural practices and constraints in the north of Rift Valley Province, Kenya*. Kitale: Kenya Agricultural Research Institute. pp. 248-251.
- Cheuk, W. Y. B.** 2005. Applying Sense-Making methodology to establish communities of practice: examples from the British Council. Paper presented at a non-divisional workshop held at the meeting of the International Communication Association, New York, May 2005. <[http://communication.sbs.ohio-state.edu/sense-making/meet/2005/meet05cheuk\\_ex.pdf](http://communication.sbs.ohio-state.edu/sense-making/meet/2005/meet05cheuk_ex.pdf)> 23 November 2007.
- Cheuk, W. Y. B.** 2007a. Applying Sense-making and narrative techniques to capture lessons learnt. *Journal of Information and Knowledge Management* 3(6):165-171.
- Cheuk, W. Y. B.** 2007b. Applying Snowden's narrative technique to conduct project debrief within the British Council: an exemplar of knowledge management project. *Journal of Information and Knowledge Management* 6(1):1-8.
- Cheuk, W. Y. B., and B. Dervin.** 1999. A qualitative Sense-Making study of the information seeking situations faced by professionals in three workplace contexts. *The Electronic Journal of Communication* 9(2/3/4). <<http://communication.sbs.ohio-state.edu/sense-making/art/artabscheukdervin99ejoc.html>> 18 August 2007.
- Chikongo, A.** 2006. The potential of information and communication technologies in collecting, preserving and disseminating indigenous knowledge in Africa. *The International Information and Library Review* 38:132-138.
- Chilimo, L. W.** 2008. Information and communication technologies and sustainable livelihoods: a case of selected rural areas of Tanzania. PhD. thesis. Pietermaritzburg: UKZN.
- Chipeta, S.** 2004. Denmark: the role of livestock advisory service and skills development. In: Rivera, W. M. and G. Alex. (eds). *Extension Reform for Rural Development series Volume 5. National strategy and reform process: case studies of international initiatives*. Agriculture and Rural Development Discussion Paper 12. Washington: The World Bank. pp. 6-11.
- Chisenga, J.** 2002. Indigenous knowledge: Africa's opportunity to contribute to global information content. *South African Journal of Library and Information Science* 68(2):16-20.

- Chisenga, J., C. Entsua-Mensah and J. Sam.** 2007. Impact of globalization on the information needs of farmers in Ghana: a case study of small-scale poultry farmers. Paper presented at the World Library and Information Congress: 73rd IFLA General Conference and Council 29-23 August 2007, Durban, South Africa.
- Choo, C. W.** 1998. The management of learning: organizations as knowledge creating enterprises. In: Choo, C. W. (ed.) *The knowing organization: how organizations use information to construct meaning, create knowledge and make decisions*. Oxford: Oxford University Press.  
<<http://www.ncsl.org.uk/media/F7B/94/randd-engaged-choo.pdf>> 13 April 2007.
- Choo, C. W.** 2000. Working with knowledge: how information professionals work with organizations to manage what they know. *Library Management* 21(8):395-403.
- Clark, K. D.** 2005. Using a Sense-Making methodology self-interview to facilitate interpersonal dialogue around racism. Paper presented at a nondivisional workshop held at the meeting of the International Communication Association, May 2005, New York USA.  
<[http://communication.sbs.ohio-state.edu/sense-making/meet/2005/meet05clark\\_ex.pdf](http://communication.sbs.ohio-state.edu/sense-making/meet/2005/meet05clark_ex.pdf)> 20 November 2007.
- Clutterbuck, P.** 2001. Social inclusion and community participation.  
<<http://www.ccsd.ca/subsites/inclusion/bp/pc.htm>> 23 March 2007.
- Coakes, E. and S. Clarke.** 2006. Communities of practice. In: Schwatz, D. G. (ed.) *Encyclopedia of knowledge management*. Hershey: Idea Group Reference. pp. 30-33.
- Cohen, L., L. Manion and K. Morrison.** 2001. *Research methods in education*. 4th ed. London: Routledge Falmer.
- Cohen, L., L. Manion and K. Morrison.** 2007. *Research methods in education*. 6th ed. London: Routledge Falmer.
- Coherence in Information for Agricultural Research for Development (CIARD).** 2008. Case study: institution-based information systems. Kenya Agricultural Information Network (KAINet). Planning and strategy building.  
<[http://www.ciard.net/fileadmin/uploads/CIARD/CIARD\\_documents/Case\\_Study\\_Kenya\\_KAInet.pdf](http://www.ciard.net/fileadmin/uploads/CIARD/CIARD_documents/Case_Study_Kenya_KAInet.pdf)> 15 April 2010.
- Coleman, J.** 1988. Social capital in the creation of human capital. *American Journal of Sociology* 94 (supplement):s95-s120.
- Coleman, J.** 1994. *Foundations of social theory*. Cambridge: Harvard University Press.
- Colle, R. D. and R. Roman.** 2003. *Handbook for telecentre staffs*. Ithaca: Cornell University.  
<<http://www.comminit.com/en/node/266894/307>> 9 April 2008.
- Collier, P.** 1998. Social capital and poverty. World Bank Social Capital Initiative Working Paper no. 4. Washington: The World Bank.
- Collins English dictionary.** 2006. Glasgow: Harper Collins.
- Collinson, C., K. Wanda, A. Muganga and S. Ferris.** 2003. A market opportunities survey for value-added utilization of cassava-based products in Uganda. Part II: Supply chain analysis constraints and opportunities for growth and development. Ibadan: ASARECA / IITA.
- Commission on Federal Paperwork.** 1977. *Information resources management*. Washington: US Government Printing Office.
- Conley, T. and C. Udry.** 2001. Social learning through networks: the adoption of new agricultural technologies in Ghana. *American Journal of Agricultural Economics* 83(3):668-673.
- Cook, J. A.** 2009. *Smallholder agriculture and the environment in a changing global context*. Macroeconomics for sustainable development Programme Office. Washington: WWF.
- Cook, T. D. and D. T. Campbell.** 2004. Validity. In: Seale, C. (ed.) *Social research methods: a reader*. London: Routledge. pp. 48-53.
- Cooper, D. R. and P. S. Schindler.** 2003. *Business research methods*. 8th ed. New York: McGraw-Hill.
- Cooper, P. and G. L. Denning.** (eds). 2000. Scaling up the impact of agroforestry. Research report of the Agroforestry dissemination workshop, Nairobi, Kenya, 14-15 September 1999. Nairobi: ICRAF.
- Correa, A, D. Ndiaye, K. J. Mchombu, G. M. Rodriguez, D. Rosenberg and N. U. Yapa.** 1997. Rural information provision in developing countries: measuring performance and impact. Paris: UNESCO.



- Cornwall, A., I. Guijt and A. Welbourn.** 1994. Acknowledging process: methodological challenges for agricultural research and extension. In: Scoones, I. and J. Thompson. (eds). *Beyond farmer first: rural people's knowledge, agricultural research and extension practice*. London: ITDG. pp. 98-117.
- Corty, E. W.** 20007. *Using and interpreting statistics: a practical text for the health, behavioural, and social sciences*. St. Louis, Missouri: Mosby Elsevier.
- Creswell, J. W.** 1994. *Research design: qualitative and quantitative approaches*. Thousand Oaks: Sage Publications.
- Creswell, J. W.** 2002. *Qualitative inquiry and research design: choosing among five approaches*. 2nd ed. Thousand Oaks: Sage Publications.
- Creswell, J. W.** 2003. *Research design: qualitative, quantitative and mixed methods approaches*. 2nd ed. Thousand Oaks: Sage Publications.
- Creswell, J. W.** 2007. *Qualitative inquiry and research design: choosing among five approaches*. 2nd ed. Thousand Oaks: Sage Publications.
- Creswell, J. W. and V. L. Plano Clark.** 2007. *Designing and conducting mixed methods research*. Thousand Oaks: Sage Publications.
- Creswell, J. W., V. L. Plano Clark. and A. L. Garrett.** 2008. Methodological issues in conducting mixed methods research designs. In: Bergman, M. M. (ed.) *Advances in mixed methods research*. Los Angeles: Sage Publications. pp. 66-83.
- Creswell, J. W., V. L. Plano Clark., M. L. Gutmann and W. E. Hanson.** 2003. Advanced mixed methods research designs. In: Tashakkori, A. and C. Teddlie. (eds). *Handbook of mixed methods in social and behavioral research*. Thousand Oaks: Sage Publications. pp. 209-239.
- Critchley, W. and V. Nyagah.** 2000. Promoting farmer innovation. *ILEIA Newsletter* July 2000:25.
- Cronjé, J. C. and D. Burger.** 2006. Learning from a free-access digital information kiosk in Africa: an objectivist – constructivist investigation. *Aslib Proceedings: New Information Perspectives* 58(3):218-236.
- Cross, R. and L. Baird.** 2000. Technology is not enough: improving performance by building organizational memory. *Sloan Management Review* 41(3):69-78.
- Curry, J., M. Kooijman and H. Recke.** (eds). 1998. *Institutionalising gender in agricultural research: experiences from Kenya*. Proceedings of the Gender Conference, KARI Headquarters, Nairobi, Kenya 5-7 October 1998. Nairobi: KARI.
- Curtis, A. and Cooke, P.** 2006. Landcare groups in Victoria: after twenty years. A report to the Australian Government Department of Agriculture, Fisheries and Forestry, National Landcare Program, Monitoring and Evaluation Project.  
<[http://www.landcarevic.net.au/resources/publications/manual/2004-landcare-survey/CSU\\_Vic\\_Landcare\\_survey\\_2004\\_Exec\\_Summary\\_final.pdf](http://www.landcarevic.net.au/resources/publications/manual/2004-landcare-survey/CSU_Vic_Landcare_survey_2004_Exec_Summary_final.pdf)> 7 November 2007.
- Dalkir, K.** 2005. *Knowledge management in theory and practice*. Amsterdam: Elsevier.
- Danish Development Cooperation.** 2005. Danish country strategy for Kenya: 2006-2010.
- Darroch, M. A. G. and T. Mushayanyama.** 2009. How can the competitiveness of the Ezemvelo farmers' organisation supply chain be improved? In: Hendriks, S. L. and M. C. Lyne. (eds). Does food security improve when smallholders access a niche market? Lessons from the Embo Community in South Africa. Pietermaritzburg: The African Centre for Food Security. pp. 93-105.
- Daudu, S.** 2009. Problems and prospect of folk media usage for agricultural extension service delivery in Benue State, Nigeria. *Journal of Human Ecology* 25(1):19-24.
- Daudu, S., S. S. Chado and A. A. Igbashal.** 2009. Agricultural information sources utilized by farmers in Benue State, Nigeria. *Production Agriculture and Technology* 5(1):39-48.
- Davenport, T. and L. Prusak.** 1997. *Information ecology: mastering the information and knowledge environment*. New York: Oxford University Press.
- Davenport, T. and L. Prusak.** 1998. *Working knowledge: how organisations manage what they know*. Boston: Harvard Business School Press.
- Davenport, T. and L. Prusak.** 2000. *Working knowledge: how organisations manage what they know*. Boston: Harvard Business School Press.
- Davis, E.** 2005. Communities of practice. In: Fisher, K. E., S. Erdelez and L. E. F. McKechnie. (eds). *Theories of information behaviour* (ASIST Monograph). Medford, NJ: Information Today. pp. 104-107.

- Davis, J.** 2003. Empirical evidence on human capital externalities. University of Western Ontario, RBC Financial Group Economic Policy Research Institute Working Paper 20035.
- Davis, K. E.** 2004. Technology dissemination among small-scale farmers in Meru Central district of Kenya: impact of group participation. PhD. thesis. Florida: University of Florida.
- Davis, K. E.** 2006. Institutional arrangements for increasing the dissemination role of farmers' groups in agricultural innovation systems.
- Davis, K. E., J. Ekboir and D. J. Spielman.** 2008. Strengthening agricultural education and training in sub-Saharan Africa from an innovation systems perspective: a case study of Mozambique. *Journal of Agricultural Education and Extension* 14(1):35-51.
- Davis, R.** 2006. How can the poor benefit from the growing markets for high value agricultural products? High value agricultural products workshop. <[http://www.egfar.org/documents/02\\_-\\_Meetings/Workshops/Workshop\\_on\\_High\\_Value\\_Products\\_Oct\\_2005/global\\_issues\\_paper.pdf](http://www.egfar.org/documents/02_-_Meetings/Workshops/Workshop_on_High_Value_Products_Oct_2005/global_issues_paper.pdf)> 24 March 2007.
- De Brún, C.** 2005. ABC of knowledge management. NHS National Library for Health. <<http://www.library.nhs.uk/knowledgemanagement/>> 14 August 2009.
- De Haen, H., G. Henne and M. Stoyke.** 2007. Second European forum on sustainable rural development. Conference report. Berlin, 18-21 June 2007. <<http://www.ruralforum.info/>> 25 March 2008.
- De Leeuw, E. and J. Hox.** 2008. Mixing data collection methods: lessons from social survey research. In: Bergman, M. M. (ed.) *Advances in mixed methods research*. Los Angeles: Sage Publications. pp. 138-149.
- De Villiers, A. K.** 1996. Quantifying indigenous knowledge: a rapid method for assessing crop performance without field trials. Agricultural Research and Extension Network (AgREN). Network Paper no. 66. London: ODI.
- De Vos, A. S. (ed.)** 1998. *Research at grass roots: a primer for the caring professionals*. Pretoria: Van Schaik Publishers.
- Dekker, P. and E. M. Uslaner.** (eds). 2001. *Social capital and participation in everyday life*. London: Routledge.
- Del Castello, R. and P. M. Braun.** (eds). 2006. *Framework on effective rural communication for development*. Rome: FAO and GTZ.
- The Delphi Group.** 2006. Innovation: from art to science. A Delphi Group White Paper. <[http://www.delphigroup.com/whitepapers/pdf/2006Innovation\\_WP.pdf](http://www.delphigroup.com/whitepapers/pdf/2006Innovation_WP.pdf)> 20 March 2010.
- Demiryurek, K., H. Erdem, V. Ceyhan, S. Atasever and O. Uysal.** 2008. Agricultural information systems and communication networks: the case of dairy farmers in the Samsun province of Turkey. *Information Research* 13(2) <<http://informationr.net/ir/13-2/paper343.html>> 1 February 2010.
- Den Biggelaar, C. and D. A. Mugo.** 1996. Linking actors in the agricultural knowledge system in Embu District. AFRENA Report no. 103. Nairobi: ICRAF.
- Denzin, N. K.** 1978. *The research act: a theoretical introduction to sociological methods*. 2nd. ed. New York: McGraw-Hill.
- Denzin, N. K.** 2009. *The research act: a theoretical introduction to sociological methods*. New Jersey: Transaction Publishers, Rutgers.
- Denzin, N. K. and Lincoln, Y. S.** 1994. Introduction: entering the field of qualitative research. In: Denzin, N. K. and Y. S. Lincoln. *Handbook of qualitative research*. Thousand Oaks: Sage Publications. pp. 1-17.
- Denzin, N. K. and Y. S. Lincoln.** (eds). 2005a. *Handbook of qualitative research*. 2nd. ed. Thousand Oaks: Sage Publications.
- Denzin, N. K. and Y. S. Lincoln.** 2005b. Introduction: the discipline and practice of qualitative research. In: Denzin, N. K. and Y. S. Lincoln. (eds). *Handbook of qualitative research*. 2nd. ed. Thousand Oaks: Sage Publications. pp. 1-28.
- DePaula, R. and G. Fischer.** 2005. Knowledge management: why learning from the past is not enough!. In: Davis, J, E. Subrahmanian and A. Westerberg. (eds). *Knowledge management: organizational and technological dimensions*. New York: Physica-Verlag. pp. 21-53.
- Dervin, B.** 1983. An overview of Sense-Making research: concepts, methods and results to date. Paper presented at the International Communication Association Annual Meeting, Dallas,

- Texas, USA, May 1983. <<http://communication.sbs.ohio-state.edu/sense-making/art/artdervin83.html>> 3 April 2008.
- Dervin, B.** 1989. Users as research inventions: how research categories perpetuate inequities. *Journal of Communication* 38(3):216-232. Reprinted in: Dervin, B., L. Foreman-Wernet and E. Lauterbach. (eds). *Sense-Making methodology reader: selected writings of Brenda Dervin*. Cresskill: Hampton Press. pp. 47-60.
- Dervin, B.** 1992. From the mind's eye of the 'user': the sense-Making qualitative-quantitative methodology. In: Glazier, J. D. and R. R. Powell. *Qualitative Research in Information Management*. Englewood: Libraries Unlimited. pp. 61-84.  
<<https://www.ideals.uiuc.edu/html/2142/2281/Dervin1992a.htm>> 2 March 2008.
- Dervin, B.** 1993. Verbing communication: mandate for disciplinary invention. *Journal of Communication* 43(3):45-54.
- Dervin, B.** 1996. Information needs and information seeking: the search for questions behind the research agenda. *UCLA-NSF Workshop on Social aspects of digital libraries*.  
<<http://is.gseis.ucla.edu/research/dl/dervin.html>> 9 September 2007.
- Dervin, B.** 1998. Sense-making theory and practice: an overview of user interests in knowledge seeking and use. *Journal of Knowledge Management* 2(2):36-46.
- Dervin, B.** 1999. On studying information seeking methodology: the implications of connecting metatheory to method. *Information Processing and Management* 35:727-750.
- Dervin, B.** 2001. What we know about information seeking and use and how research discourse community makes a difference in our knowing. Background paper prepared for Health Information Programs Development, National Library of Medicine, Bethesda, MD.  
<<http://communication.sbs.ohio-state.edu/sense-making/artdirect/artdervin01nlm.html>> 25 April 2007.
- Dervin, B.** 2003a. Information – democracy: an examination of underlying assumptions. In: Dervin, B., L. Foreman-Wernet and E. Lauterbach. (eds). *Sense-Making methodology reader: selected writings of Brenda Dervin*. Cresskill: Hampton Press Inc. pp. 73-100.
- Dervin, B.** 2003b. Comparative theory reconceptualized: from entities and states to processes and dynamics. In: Dervin, B., L. Foreman-Wernet and E. Lauterbach. (eds). *Sense-Making methodology reader: selected writings of Brenda Dervin*. Cresskill: Hampton Press Inc. pp. 61-71.
- Dervin, B.** 2003c. Information as non-sense: information as sense: the communication technology connection. In: Dervin, B., L. Foreman-Wernet and E. Lauterbach. (eds). *Sense-Making methodology reader: selected writings of Brenda Dervin*. Cresskill: Hampton Press Inc. pp. 293-308.
- Dervin, B.** 2005a. Welcome to the Sense-Making methodology site.  
<<http://communication.sbs.ohio-state.edu/sense-making/>> 25 April 2007.
- Dervin, B.** 2005b. What methodology does to theory: Sense-Making methodology as exemplar. In: Fisher, K. E., S. Erdelez and L. E. F. McKechnie. (eds). *Theories of information behavior*. (ASIST Monograph). Medford: Information Today. pp. 25-43.
- Dervin, B.** 2006a. Beyond communication: research as communicating. Making user and audience studies matter-paper 2. *Information Research* 12(1) <<http://informationr.net/ir/12-1/paper287.html>> 25 April 2007.
- Dervin, B.** 2006b. Project overview: Sense-Making methodology as dialogic approach to communicating for research and practice. In: Dervin, B., C. D. Reinhard, S. K. Adamson, T. T. Lu, N. M. Karnolt, and T. Berberick. (eds). *Sense-making the information confluence: the whys and hows of college and university user satisficing of information needs. Phase I: project overview, the Three-Field Dialogue Project, and state-of-the-art reviews*. Report on National Leadership Grant LG-02-03-0062-03, to Institute of Museum and Library Services. Washington: Ohio State University.
- Dervin, B.** 2007. Applying Sense-Making methodology to focus group design: Addressing both collective and individual agency. Presented at Non-Divisional Working Symposium on "Making communication studies matter: Field relevance/irrelevance to media, library, electronic, communication system designs, policies, practices." May 24, San Francisco.  
<[http://communication.sbs.ohio-state.edu/sense-making/meet/2007/meet07\\_dervin.pdf](http://communication.sbs.ohio-state.edu/sense-making/meet/2007/meet07_dervin.pdf)> 27 November 2007.



- Dervin, B. and anonymous students.** 1997. A study of user sense-making of new communication technologies, past and present: the sense-making instrument with sample interviews. <<http://communication.sbs.ohio-state.edu/sense-making/inst/idern97tech.html>> 20 April 2007.
- Dervin, B. and C-L. D. Reinhard.** 2006. Researchers and practitioners talk about users and each other. Making user and audience studies matter—paper 1. *Information Research* 12(1) Paper 286. <<http://InformationR.net/ir/12-1/paper286.html>> 5 February 2008.
- Dervin, B. and K. D. Clarke.** 1999. Exemplars of the use of the Sense-Making methodology (metatheory and method): in-depth introduction to the Sense-Making issues of the Electronic Journal of Communication. *Electronic Journal of Communication* 9(2/3/4). <<http://communication.sbs.ohio-state.edu/sense-making/art/artabsdervinclarke99ejocintro.html>> 25 April 2007.
- Dervin, B. and K. D. Clarke.** 2003. Communication and democracy: a mandate for procedural invention. In: Dervin, B., L. Foreman-Wernet and E. Lauterbach. (eds). *Sense-Making methodology reader: selected writings of Brenda Dervin*. Cresskill: Hampton Press Inc. pp. 165-193.
- Dervin, B. and M. Frenette.** 2001. Sense-Making methodology: communicating communicatively with campaign audiences. In: Rice, R. E. and C. K. Atkin. (eds). *Public communication campaigns*. 3rd ed. Thousand Oaks: Sage Publications. Reprinted in Dervin, B., L. Foreman-Wernet and E. Lauterbach. (eds). *Sense-Making methodology reader: selected writings of Brenda Dervin*. Cresskill: Hampton Press. pp. 235-249.
- Dervin, B., L. Foreman-Wernet and E. Lauterbach.** 2003. *Sense-Making methodology reader: selected writings of Brenda Dervin*. Cresskill: Hampton Press.
- Dervin, B. and M. Nilan.** 1986. Information needs and uses. *Annual Review of Information Science and Technology* 21:3-33. New York: Knowledge Industry Publications.
- Dervin, B. and M. Song.** (eds). 2004. Communication as a field - historical origins, diversity as strength/weakness, orientation toward research in the public interest: 54 ruminations from field grandparents, parents, and a few feisty grandchildren. Background paper for the "Strength of our methodological divides: five navigators, their struggles and successes" plenary and post-plenary dialogue, International Communication Association annual meeting, May 27-31, New Orleans, LA.
- Deutsche Gesellschaft für Technische Zusammenarbeit (GTZ) GmbH.** 2004. National monitoring of sustainable poverty reduction strategies / PRSPs. Volume 2: country study Kenya. Bonn: GTZ.
- Deutsche Gesellschaft für Technische Zusammenarbeit (GTZ). Sustainet.** 2006. *Sustainable agriculture: a pathway out of poverty for East Africa's rural poor. Examples from Kenya and Tanzania*. GTZ, Eschborn.
- Di Mauro, S. E.** 2003. Disaggregating local knowledge: the effects of gendered farming practices on soil fertility and soil reaction in SW Hungary. *Geoderma* 111:503-520.
- Diao, X., P. Dorosh, S. M. Rahman, S. Meijer, M. Rosegrant, Y. Yanoma and W. Li.** 2003. Market opportunities for African agriculture: an examination of demand-side constraints on agricultural growth. *DSGD Discussion Paper* no. 1. Washington: IFPRI.
- Diao, X., P. Hazell, D. Resnick and J. Thurlow.** 2007. The role of agriculture in development: implications for Sub-Saharan Africa. IFPRI Report 153. Washington: IFPRI.
- Dick, A. L.** 1993. Three paths to inquiry in library and information science: positivist, constructivist and critical theory approaches. *South African Journal of Library and Information Science* 61(2):53-60.
- Diesing, P.** 1991. *How does social science work?: reflections on practice*. Pitt Series in Policy and Institutional Studies. Pittsburgh: University of Pittsburgh Press.
- Dijkstra, T.** 1996. Food assembly markets in Africa: lessons from the horticultural sector in Kenya. *British Food Journal* 98(9):26-34.
- Dimara, E., A. Petrou and D. Skuras.** 2003. The socio-economics of niche market creation: a social ecology paradigm for the adoption of organic cultivation in Greece. *International Journal of Social Economics* 30(3):219-235.
- Dinucci, A. and Z. Fre.** 2003. *Understanding the indigenous knowledge and information systems of pastoralists in Eritrea*. Communication for Development Case Study 26. Rome: FAO.

- Dissanayake, W.** 1992. Knowledge, culture, and power: some theoretical issues related to the agricultural knowledge and information system framework. *Knowledge and Policy* 5(1). <<http://web.ebscohost.com/ehost/detail?vid=4&hid=122&sid=32bf203b-7c46-43c0-89ad-7e9fd2004f9e%40sessionmgr106>> 20 March 2007.
- Dixon, J. M., M. Hall, J. B. Hardaker, V. S. Vyas.** 1994. *Farm and community information use for agricultural programmes and policies*. FAO Farm Systems Management Series 8. Rome: FAO.
- Dixon, R. B.** 1982. Women in agriculture: counting the labour force in developing countries. *Population and Development Review* 8(3):539-566.
- Dobson, P. J.** 2002. Critical realism and information systems research: why bother with philosophy. *Information Research* 7(2) <<http://informationr.net/ir/7-2/paper124.html>> 9 January 2008.
- Dooley, K., T. Johnson and D. Bush.** 1995. TQM, chaos, and complexity. *Human Systems Management* 14(4):1-16.
- Doss, C. R.** 2001. Designing agricultural technology for African women farmers: lessons from 25 years of experience. *World Development* 29(12):2075-2092.
- Drucker, P. F.** 1998. The coming of the new organization. In: *Harvard Business Review on Knowledge Management*. Harvard: Harvard Business School Press. pp. 1-19.
- Drucker, P. F.** 1999. *Management challenges for the 21st Century*. London: Butterworth Heinemann.
- Drucker, P. F.** 2007. *The essential Drucker: the classic Drucker collection*. Burlington: Elsevier.
- Du Plessis, M.** 2007. The role of knowledge management in innovation. *Journal of Knowledge Management* 11(4):20-29.
- Duffy, M. E.** 1987. Methodological triangulation: a vehicle for merging quantitative and qualitative research methods. *IMAGE: Journal of Nursing Scholarship* 19(3):130-133.
- Duke, A. and C. Long.** 2007. Trade from the ground up: a case study of a grass roots NGO using agricultural programs to generate economic viability in developing countries. *Management Decision* 45(8):1320-1330.
- Dunleavy, P.** 2003. *Authoring a PhD: how to plan, draft, write and finish a doctoral thesis or dissertation*. New York: Palgrave Macmillan.
- Duram, L. A. and K. L. Larson.** 2001. Agricultural research and alternative farmers' information needs. *Professional Geographer* 53(1):84-96.
- Durrheim, K.** 2006. Research design. In: Terre Blanche, M., K. Durrheim and D. Painter. (eds). *Research in practice: applied methods for the social sciences*. 2nd ed. Cape Town: University of Cape Town. pp. 34-59.
- Durrheim, K. and D. Painter.** 2006. Collecting quantitative data: sampling and measuring. In: Terre Blanche, M., K. Durrheim and D. Painter. (eds). *Research in practice: applied methods for the social sciences*. 2nd revised ed. Cape Town: University of Cape Town. pp. 131-159.
- Dutta, R.** 2009. Information needs and information-seeking behaviour in developing countries: a review of the research. *The International Information and Library Review* 41:44-51.
- Duvel, G. H.** 2005. Identification and acceptability of linkage principle and their implementation in the promotion of participatory extension and rural development in South Africa. *Journal of Extension Systems* 21(2):1-11.
- Duveskog, D., C. Mburu and W. Critchley.** 2002. Harnessing indigenous knowledge and innovation in farmer field schools. Paper submitted to the International Workshop on Farmer Field Schools, Indonesia, 21-25 Oct. 2002.
- Duveskog, D. and E. Friis-Hansen.** 2009. Farmer field schools: a platform for transformative learning in rural Africa. In: Mezirow, J. and E. Taylor. (eds). *Transformative learning in action: handbook of practice*. New York: Jossey-Bass. pp. 240-250.
- Dwivedi, R. S.** 1997. *Research methods in behavioural sciences*. New Delhi: Macmillan.
- Dyck, B.** 1997. Build in sustainable development and they will come: a vegetable field of dreams. *British Food Journal* 99(9):325-335.
- E Cunha, M. P. and J. V. da Cunha.** 2006. Towards a complexity theory of strategy. *Management Decision* 44(7):839-850.
- Easdown, W. and A. Starasts.** 2004. Constructing useful information for farmers – the role of IT. In: *New directions for a diverse planet. Proceedings of the 4th International Crop Science Congress* Brisbane, Australia, 26 September – 1 October 2004.



- East African Correspondent.** 2008. Kenya's master plan will ensure universal access. *The East African* 21-27 April. p. 31.
- East African Reporter.** 2008. Kenya goes mobile with a vengeance. *The East African* 21-27 April, p.2.
- Easterby-Smith, M., R. Thorpe and A. Lowe.** 1991. *Management research: an introduction*. 1st ed. London: Sage Publications.
- Easterby-Smith, M., R. Thorpe and A. Lowe.** 2002. *Management research: introduction*. 2nd ed. London: Sage Publications.
- Eckert, E. and A. Bell.** 2005. Invisible force: farmers' mental models and how they influence learning and actions. *Journal of Extension* 43(3) <<http://www.joe.org/joe/2005june/a2.php>> 15 January 2010.
- Eckert, E. and A. Bell.** 2006. Continuity and change: themes on mental model development among small-scale farmers. *Journal of Extension* 44(1) <<http://www.joe.org/joe/2006february/a2.php>> 15 January 2010.
- Economic Commission for Africa (ECA) and African Union (AU).** 2007. *Economic report on Africa 2007*. AddisAbaba: United Nations Economic Commission for Africa (UNECA).
- Economic Commission for Africa (ECA).** 2005a. *Emerging issues in science and technology for Africa's development: science, technology and innovation for meeting key MDGs*. Addis Ababa: ECA Sustainable Development Division.
- Economic Commission for Africa (ECA).** 2005b. *Economic report on Africa 2005: meeting challenges of unemployment and poverty in Africa*. Addis Ababa: ECA.
- Eicher, C. K.** 1999. Institutions and the African farmer. *Issues in Agriculture* 14. CGIAR.
- Eicher, C. K.** 2004. Rebuilding Africa's scientific capacity in food and agriculture. Michigan State University Background Paper no. 4. Staff paper 2004-12.
- Eklund, J.** 2009. Agroforestry as a tool toward sustainable development in Babati district. Bachelor's thesis. Stockholm: Södertörn University College. <<http://urn.kb.se/resolve?urn=urn:nbn:se:sh:diva-2814>> 23 March 2010.
- Ekoi, A. E. and A. Hepelwa.** 2003. Farmers themselves can defend their interests: networks of farmers' groups in Tanzania. <<http://www.afrique-gouvernance.net/fiches/dph/fiche-dph-113.html>> 25 March 2008.
- Emery, A. R.** 2000. *Integrating indigenous knowledge in project planning and implementation*. Ontario: KIVU Nature Inc.
- Empsen, L.** 2001. Introduction: knowledge management in professional service firms. *Human Relations* 54(7):811-817.
- Engel, P. G. H.** 1995. Facilitating innovation: an action-oriented approach and participatory methodology to improve innovative social practice in agriculture. PhD. diss. Wageningen: Wageningen University. [abstract]. <<http://library.wur.nl/wda/abstracts/ab1888.html>> 24 July 2007.
- Engel, P. G. H.** 1997. *The social organisation of innovation: a focus on stakeholder interaction*. Amsterdam: Royal Tropical Institute.
- Engel, P. G. H. and M. Salomon.** 1997. *Facilitating innovation for development: a RAAKS resource box*. Amsterdam: Royal Tropical Institute.
- Engel, P. G. H. and M. Salomon.** 2003. Cognition, development and governance: some lessons from knowledge systems research and practice. Paper presented at Linking Research and Rural Innovation to Sustainable Development. 2nd Triennial GFAR Conference, 22-24 May 2003, Dakar, Senegal. Rome: GFAR.
- Esteves, J. and J. Pastor.** 2004. Using a multimethod approach to research enterprise systems implementations. *Electronic Journal of Business Research Methods* 2(2):69-82.
- ETC East Africa.** 2000. Agricultural knowledge and information systems (AKIS) of Trans Nzoia, West Pokot, Homa Bay and Kiambu. Volume 6: executive summary.
- EurepGAP.** 2007. EurepGAP. <<http://www.eurepgap.org/Languages/English/about.html>> 15 June 2007.
- Evgeniou, T. E. and P. Cartwright.** 2005. Barriers to information management. *European Management Journal* 23(3):293-299.

- Failing, L., R. Gregory and M. Harstone.** 2007. Methodological and ideological options. Integrating science and local knowledge in environmental risk management: a decision-focused approach. *Ecological Economics* 64:47-60.
- Fakava, V., P. Nuthall and G. Nartea.** 2001. Objectives, subsistence and farm development: the case of Tonga. Research report no. 02/2001. Canterbury: Lincoln University, Farm and Horticultural Management Group.  
<<http://researcharchive.lincoln.ac.nz/dspace/handle/10182/79>> 14 February 2010.
- Farah, I. O.** 2008. Foreword. In: Gichere, N., G. M. Kirigia, Z. Murianki, S. A. Mugambi Mwithimbu, S. Mathiu, M. Thuku, E. Mutwiri and S-I. Ishida. *The indigenous knowledge of the Ameru of Kenya*. 2nd ed. Meru: Meru Museum.
- Fatima, A.** 2009. Socio-economic constraints to demand for borrowing among rural females of Pakistan. *International Journal of Social Economics* 36(11):1050-1070.
- Favell, A.** 1993. James Coleman: social theorist and moral philosopher. *The American Journal of Sociology* 99(3):590-613.
- Federation of Women Lawyers (FIDA).** 2006. Baseline survey on the level of awareness and impact of CEDAW on rural women in Kenya.  
<<http://www.fidakenya.org/publication/Baseline%20Survey.pdf>> 15 April 2010.
- Fern, E. F.** 2001. *Advanced focus group research*. London: Sage Publications.
- Ferreira, S. D. M. and M. Neto.** 2005. Knowledge management and social learning: exploring the cognitive dimension of social learning. *Knowledge Management for Development Journal* 1(3):4-17.
- Ferris, S.** 2004. Foodnet: information is changing things in the marketplace. *ICT Update* 18(3)  
<<http://ictupdate.cta.int/en/Feature-Articles/FOODNET-information-is-changing-things-in-the-marketplace>> 26 August 2007.
- Ferris, S., P. Engoru and E. Kaganzi.** 2008. Making market information services work better for the poor in Uganda. The CGIAR Systemwide Programme on Collective Action and Property Rights (CAPRI) Working Paper no. 77. Washington: IFPRI.
- Finch, H. and J. Lewis.** 2003. Focus groups. In: Ritchie, J. and J. Lewis. (eds). *Qualitative research practice: a guide for social science students and researchers*. London: Sage Publications. pp. 170-198.
- Fink, A.** 2010. *Conducting research literature reviews: from the internet to paper*. 3rd ed. Thousand Oaks: Sage Publications.
- Firestone, J. M. and M. W. McElroy.** 2003. *Key issues in the new knowledge management*. Amsterdam: Butterworth Heinemann.
- Firestone, W. A.** 1987. Meaning in method: the rhetoric of quantitative and qualitative research. *Educational Researcher* 16(7):16-21.
- Firestone, W. A.** 1993. Alternative arguments for generalizing from data as applied to qualitative research. *Educational Researcher* 22(4):16-23.
- Fisher, C. B. and A. E. Anushko.** 2008. Research ethics in social science. In: Alasuutari, P., L. Bickman and J. Brannen. (eds). *The SAGE handbook of social research methods*. Los Angeles: Sage Publications. pp. 269-289.
- Fisk, J. W., O. B. Hesterman and T. L. Thornburn.** 1998. Integrated farming systems: a sustainable agriculture learning community in the USA. In: Röling, N. G. and M. A. E. Wagemakers. (eds). *Facilitating sustainable agriculture: participatory learning and adaptive management in times of environmental uncertainty*. Cambridge: Cambridge University Press. pp. 217-231.
- Flick, U.** 2002. *An introduction to qualitative research*. 2nd ed. London: Sage Publications.
- Food and Agriculture Organisation of the United Nations (FAO).** 1998. Small farmer group associations: bringing the poor together. E-mail conference. 24 September – 11 November 1998. SD dimensions. FAO, Sustainable Development Department.  
<<http://www.fao.org/sd/PPdirect/PPfo0001.htm>> 17 March 2007.
- Food and Agriculture Organisation of the United Nations (FAO).** 2000. The role of information and communication technologies in rural development and food security. Rome: FAO.  
<<http://www.fao.org/sd/CDdirect/CDre0055.htm>> Accessed 6 September 2007.
- Food and Agriculture Organisation of the United Nations (FAO).** 2001. Farmer Information Network (FarmNet) <[http://www.fao.org/sd/2001/kn1008\\_en.htm](http://www.fao.org/sd/2001/kn1008_en.htm)> 2 April 2007.

- Food and Agriculture Organisation of the United Nations (FAO).** 2003. The Virtual Research Communication Network (VERCON). <<ftp://ftp.fao.org/sd/vercon.pdf>> 3 April 2007.
- Food and Agriculture Organisation of the United Nations (FAO).** 2004. *The state of agricultural commodity markets (SOCO) 2004*. Rome: FAO.
- Food and Agriculture Organisation of the United Nations (FAO).** 2007. Monitoring progress since the World Food Summit. <[http://www.fao.org/monitoringprogress/summit\\_en.html](http://www.fao.org/monitoringprogress/summit_en.html)> 19 October 2007.
- Food and Agriculture Organisation of the United Nations (FAO) and The World Bank.** 2000. *Agricultural knowledge and information systems for rural development (AKIS/RD): strategic vision and guiding principles*. Rome: FAO. <<http://www.fao.org/sd/EXdirect/EXre0027.htm>> 17 March 2007.
- Food and Agriculture Organisation of the United Nations (FAO). Communication for Development Group.** 1998. Knowledge and information for food security in Africa: from traditional media to the Internet. <<http://www.fao.org/sd/CDdirect/CDan0017.htm>> 27 October 2007.
- Food and Agriculture Organisation of the United Nations (FAO). LinKS Project.** 2003. Planning workshop for LinKS seed management research in Tanzania. 27-31 January 2003, Morogoro, Tanzania. Workshop proceedings. <[http://www.fao.org/sd/LINKS/documents\\_download/REP%20%20Proceedings%20Planning%20WorkshopFeb.pdf](http://www.fao.org/sd/LINKS/documents_download/REP%20%20Proceedings%20Planning%20WorkshopFeb.pdf)> 3 October 2007.
- Food and Agriculture Organisation of the United Nations (FAO). Noragric LinKS Project.** 2004. A study of local knowledge in relation to management of agro-biodiversity for food security: case study on local seed management systems in Southern Highlands and Central Zone, Tanzania. Report no. 20. <[http://www.tanzaniagateway.org/docs/Management\\_of\\_agrobiodiversity\\_in\\_Tanzania\\_Noragric\\_Jan2004.pdf](http://www.tanzaniagateway.org/docs/Management_of_agrobiodiversity_in_Tanzania_Noragric_Jan2004.pdf)> 16 April 2008.
- Foodnetwork (Foodnet).** 2007. Foodnet. <<http://www.foodnet.cgiar.org/>> 15 March 2007.
- Foreman-Wernet, L.** 2003. Rethinking communication: introducing the Sense-Making methodology. In: Dervin, B., L. Foreman-Wernet and E. Lauterbach. (eds). *Sense-Making methodology reader: selected writings of Brenda Dervin*. Cresskill: Hampton Press Inc. pp. 3-16.
- Foreman-Wernet, L.** 2005. Sense-Making elite and popular culture products: an exemplar study using Sense-Making methodology. Paper presented at a non-divisional workshop held at the meeting of the International Communication Association, New York city.
- Foreman-Wernet, L. and B. Dervin.** 2000. Beyond dominance and resistance: looking for "something more" in audience interpretations of popular and elite culture. Paper presented at the meeting of the National Communication Association, Critical and Cultural Studies Division, Seattle, WA. November 2000.
- Foreman-Wernet, L. and B. Dervin.** 2006. Listening to learn: "inactive" publics of the arts as exemplar. *Public Relations Review* 32:287-294.
- Foti, R., O. Nyakudya, M. Moyo, J. Chikuvire.** 2007. Determinants of farmer demand for fee-for-service extension in Zimbabwe's agricultural sector: the case of Mashonaland Central Province. *IAALD Quarterly Bulletin* LII(1/2):28-34.
- Fountas, S., D. Wulfsohn, B. S. Blackmore, H. L. Jacobsen and S. M. Pedersen.** 2006. A model of decision-making and information flows for information-intensive agriculture. *Agriculture Systems* 87:192-210.
- Fourie, I.** 2004. A theoretical model for studies on web information-seeking behaviour: how to look and what we might see. In: Bothma, T. and A. Kaniki. (eds). *Progress in Library and Information Science in Southern Africa (ProLISSA)* Pretoria: Infuse. pp. 69-97.
- Fourie, I.** 2006. Learning from web information seeking studies: some suggestions for LIS practitioners. *The Electronic Library* 24(1):20-37.
- Fourie, I. and T. Bothma.** 2006. Addressing the digital divide in teaching information retrieval: a theoretical view on taking students from ICT access to knowledge sharing. *Electronic Library* 24(4):369-489.
- Fourie, L.** 2007. Enhancing the livelihoods of the rural poor: the role of information and communication technologies. Country report, South Africa.



- Fowler, A.** 1992. Prioritising institutional development: a new role for NGO centres for and development. London: IIED Gatekeeper Series no. 35.
- Fox, J., R. Kanter, S. Yarnasarn, M. Ekasingh and R. Jones.** 1994. Farmer decision making and spatial variables in Northern Thailand. *Environmental Management* 18(3):391-399.
- Francis, E.** 1998. Gender and rural livelihoods in Kenya. *Journal of Development Studies* 35(2):72-95.
- Frankfort-Nachmias, C. and D. Nachmias.** 1996. *Research methods in the social sciences*. 5th. ed. London: Arnold.
- Franzel, S., C. Wambugu and P. Tuwei.** 2003. The adoption and dissemination of fodder shrubs in Central Kenya. AgREN Network Paper no. 131. London: Overseas Development Institute.
- Franzel, S., G. L. Denning, J. P. B. Lillesø and A. R. Mercado.** 2004. Scaling up the impact of agroforestry: lessons from three sites in Africa and Asia. *Agroforestry Systems* 61-62(1-3):329-344.
- Franzel, S., P. Cooper and G. L. Denning.** 2001. Scaling up the benefits of agroforestry research: lessons learned and research challenges. *Development in Practice* 11(4):524-534.
- Frappaolo, C.** 2006. *Knowledge management*. West Sussex: Capstone.
- French, J. H.** 1995. Farm household decision making and extension framework for understanding farm household-level decision making and design of agroforestry extension strategies. Training workshop on integrating woodfuel production into agroforestry extension programmes in Southeast Asia. APAN Asia-Pacific Agroforestry Network. <[http://www.fao.org/docrep/x0266e/x0266e01.htm#P15\\_788](http://www.fao.org/docrep/x0266e/x0266e01.htm#P15_788)> 22 April 2010.
- Frenette, M.** 2005. Designing anti-smoking messages from a Sense-Making methodology perspective. Paper presented at a non-divisional workshop held at the meeting of the International Communication Association, New York. [http://communication.sbs.ohio-state.edu/sense-making/meet/2005/meet05frenette\\_ex.pdf](http://communication.sbs.ohio-state.edu/sense-making/meet/2005/meet05frenette_ex.pdf)> 23 August 2007.
- Friis-Hansen and H. Egelyng.** 2007. *Supporting local innovation for rural development: analysis and reviews of five innovation support funds*. DIIS Report 2007:4. Copenhagen: Danish Institute of International Studies. <<http://orgprints.org/11304/01/diisreport-2007-4.pdf>> 17 October 2007.
- Frohmann, B.** 1992. The power of images: a discourse analysis of the cognitive viewpoint. *Journal of Documentation* 48:365-386.
- Gakuru, M., K. Winters and F. Stepman.** 2009. Innovative farmer advisory services using ICT. In: Cunningham, P. and M. Cunningham. (eds). IST Africa Conference Proceedings. 1-2 April 2009, Maputo, Mozambique. <[http://ist-africa.org/Conference2009/outbox/ISTAfrica\\_Paper\\_ref\\_85\\_doc\\_2692.pdf](http://ist-africa.org/Conference2009/outbox/ISTAfrica_Paper_ref_85_doc_2692.pdf)>. 18 November 2009.
- Galindo, I. M.** 2007. Regional development through knowledge creation in organic agriculture. *Journal of Knowledge Management* 11(5):87-97.
- Galloway, L. and R. Mochrie.** 2005. The use of ICT in rural firms: a policy-oriented literature review. *INFO* 7(3):33-46.
- Gallupe, R. B.** 2000. Knowledge management systems: surveying the landscape. Queens Business School Framework paper 00-04. Kensington: Queens University <[http://publications.ksu.edu.sa/IT%20Papers/KMS/fp\\_00-04.pdf](http://publications.ksu.edu.sa/IT%20Papers/KMS/fp_00-04.pdf)> 28 January 2007.
- Gao, F., M. Li and Y. Nakamori.** 2001. Systems thinking on knowledge and its management: systems methodology for knowledge management. *Journal of Knowledge Management* 6(1):7-17.
- Garforth, C.** 2001a. Agricultural knowledge and information systems in Hagaz, Eritrea. SD Dimensions. <[http://www.fao.org/sd/2001/KN1001a\\_en.htm](http://www.fao.org/sd/2001/KN1001a_en.htm)> 3 April 2007.
- Garforth, C.** 2001b. Analysis of local agricultural knowledge and information systems, Eritrea. <<http://www.rdg.ac.uk/IRDD/01-05.shtml>> 18 June 2007.
- Garforth, C.** 2001c. AKIS Study in sub-zoba Hagaz, Eritrea: Summary prepared for a presentation at the Ministry of Agriculture in Asmara, 22 March 2001. <<http://www.reading.ac.uk/idc/01-05.shtml>> 18 June 2007.
- Garforth, C., B. Angell, J. Archer and K. Green.** 2003. Improving farmers' access to advice on land management: lessons from case studies in developed countries. Agricultural Research and Extension Network (AgREN) paper no. 125. London: Overseas Development Institute.

- Garforth, C., C. Phillips and S. Bhatia-Panthaki.** 2007. Introduction: the private sector, poverty reduction and international development. *Journal of International Development* 19:723-734.
- Garforth, C., Y. Khatiwada and D. Campbell.** 2003. Communication research to support knowledge interventions in agricultural development: case studies from Eritrea and Uganda. Paper presented at the Development Studies Association Conference, Glasgow, 10-12 September 2003.
- Gault, S. B. and A. T. Jaccaci.** 1996. Complexity meets periodicity. *The Learning Organization* 3(2):33-39.
- GebreMichael, Y.** 2006. Endogenous and modern innovations: differing perspectives. *IK Notes* no. 96 September. Washington: The World Bank.
- Gellen, K.** 1994. Unleashing the power of women farmers. *African Farmer* 11:2-6,42.
- Gephart, R.** 1999. Paradigms and research methods. *Research Methods Forum* 4 Summer. <[http://division.aomonline.org/rm/1999\\_RMD\\_Forum\\_Paradigms\\_and\\_Research\\_Methods.htm](http://division.aomonline.org/rm/1999_RMD_Forum_Paradigms_and_Research_Methods.htm)> 18 June 2007.
- Gerdin, A.** 2002. Productivity and economic growth in Kenyan agriculture, 1964-1966. *Agricultural Economics* 27:7-13.
- Gergen, K. J.** 1999. *An invitation to social construction*. London: Sage Publications.
- Gianatti, T. M. and P. Carmody.** 2007. The use of networks to improve information flows between grower groups and researchers. *Field Crops Research* 104:165-173.
- Gîchere, N.** 2008. Indigenous knowledge research and Museum education. In: Gîchere, N., G. M. Kirigia, Z. Murianki, S. A. Mugambi Mwithimbu, S. Mathiu, M. Thuku, E. Mutwiri and S-I. Ishida. *The indigenous knowledge of the Ameru of Kenya*. 2nd ed. Meru: Meru Museum. pp. 1-7.
- Gîchere, N., G. M. Kirigia, Z. Murianki, S. A. Mugambi Mwithimbu, S. Mathiu, M. Thuku, E. Mutwiri and S-I. Ishida.** 2008. *The indigenous knowledge of the Ameru of Kenya*. 2nd ed. Meru: Meru Museum.
- Gildemacher, P., P. Maina, M. Nyongesa, P. Kinyae, G. Woldegiorgis, Y. Lema, B. Damene, S. Tafesse, R. Kakuhenzire, I. Kashaia, C. Musoke, J. Mudiope, I. Kahiu and O. Ortiz.** 2009. Participatory analysis of the potato knowledge and information system in Ethiopia, Kenya and Uganda. In: Sanginga, P.C., A. Waters-Bayer, S. Kaaria, J. Njuki and C. Wettasinha. (eds). *Innovation Africa: enriching farmers' livelihoods*. London: Earthscan. pp. 153-166.
- Giné, X.** 2005. Drumnet case study. The World Bank. <<http://siteresources.worldbank.org/DEC/Resources/DrumnetCaseStudy.pdf>> 29 December 2009.
- Giovanetti, J-F. and M. Bellamy.** 1996. New information technologies: which products, which technologies, which professions? In: *The role of information for rural development in ACP countries: review and perspectives*. Proceedings of an international seminar, 12-16 Jun 1995, Montpellier, France. Wageningen: CTA. pp. 157-179.
- Girard, B.** 2003. (ed.) *The one to watch: radio, new ICTs and interactivity*. Rome: FAO.
- Glaser, B.** 2002. Conceptualization: on theory and theorizing using grounded theory. *International Journal of Qualitative Methods* 1(2) <<http://www.ualberta.ca/~ijqm/>> 14 February 2008.
- Glaser, B. G. and J. Holton.** 2004. Remodeling grounded theory. *Forum Qualitative Social Research* 5(2) <<http://www.qualitative-research.net/fqs/>> 13 February 2008.
- Glisby, M. and N. Holden.** 2003. Contextual constraints in knowledge management theory: the cultural embeddedness of Nonaka's knowledge-creating company. *Knowledge and Process Management* 10(1):29-36.
- GLOBALGAP.** 2010. What is GLOBALGAP? <[http://www.globalgap.org/cms/front\\_content.php?idcat=9](http://www.globalgap.org/cms/front_content.php?idcat=9)> 23 January 2010.
- Gluck, M.** 1997. Making sense of semiotics: privileging respondents in revealing contextual geographic syntactic and semantic codes. In: Vakkari, T., R. Savolainen and B. Dervin. (eds). *Information seeking in context. Proceedings of an International Conference on Research in Information Needs, Seeking and Use in Different Contexts*. 14-16 August, 1996, Tampere, Finland. London: Taylor Graham. pp. 13-38.
- Godbold, N.** 2006. Beyond information seeking: towards a general model of information behaviour. *Information Research* 11(4) <<http://InformationR.net/ir/11-4/paper269.html>> 12 July 2007.

- Gordon, R. D.** 2002. Conceptualizing leadership with respect to its historical – contextual antecedents to power. *The Leadership Quarterly* 13:151-167.
- Gorjestani, N.** 2000. Indigenous knowledge for development: opportunities and challenges. Paper based on a presentation made at the UNCTAD Conference on Traditional Knowledge in Geneva, 1 November, 2000. <[http://www.worldbank.org/afr/ik/ikpaper\\_0102.pdf](http://www.worldbank.org/afr/ik/ikpaper_0102.pdf)> 14 June 2008.
- Gosling, P. and B. Noordam.** 2006. *Mastering your PhD: survival and success in the doctoral years and beyond*. Berlin: Springer Verlag.
- Gotschi, E., J. Njuki and R. Delve.** 2009. Equal numbers, equal chances? A case study of gender differences in the distribution of social capital in smallholder farmer groups in Búzi district, Mozambique. *European Journal of Development Research* 21(2):264-282.
- Goulielmos, A. M.** 2005. Complexity theory: a science where historical accidents matter. *Disaster Prevention and Management* 14(4):533-547.
- Gourlay, S.** 2003. The SECI model of knowledge creation: some empirical shortcomings. In: *Proceedings of the Fourth European Conference on Knowledge Management*, 18-19 September 2003, Oriel College, Oxford. pp. 377-386.
- Gravetter, F. J. and L-A. B. Forzano.** 2009. *Research methods for the behavioural sciences*. 3rd ed. Belmont: Wadsworth Cengage Learning.
- Gray, D. E.** 2004. *Doing research in the real world*. London: Sage Publications.
- Gray, E.** 2010. Access to Africa's knowledge: publishing development research and measuring value. *The African Journal of Information and Communication* 10. <<http://link.wits.ac.za/journal/AJIC10-Gray.pdf>> 23 April 2010.
- Greene, J. C.** 2006. Toward a methodology of mixed methods social inquiry. *Research in Schools* 13(1):93-98.
- Greene, J. C.** 2008. Is mixed methods social inquiry a distinctive methodology? *Journal of Mixed Methods Research* 2(1):7-22.
- Greene, J. C. and V. J. Caracelli.** 2003. Making paradigmatic sense of mixed methods practice. In: Tashakkori, A. and C. Teddlie. (eds). *Handbook of mixed methods in social and behavioral research*. Thousand Oaks: Sage Publications. pp. 91-110.
- Greene, J. C., H. Kreider and E. Mayer.** 2005. Combining qualitative and quantitative methods in social inquiry. In: Somekh, B. and C. Lewin. (eds). *Research methods in the social sciences*. London: Sage Publications. pp. 274-281.
- Greene, J. C., V. J. Caracelli and W. F. Graham.** 1989. Toward a conceptual framework for mixed-method evaluation designs. *Educational Evaluation and Policy Analysis* 11(3):516-537.
- Greenwood, D. J. and M. Levin.** 2008. Reform of the social sciences and of universities through action research. In: Denzin, N. K. and Y. S. Lincoln. (eds). *The landscape of qualitative research*. 3rd. ed. Thousand Oaks: Sage Publications. pp. 57-86.
- Gregory, R. J.** 1999. Social capital theory and administrative reform: maintaining ethical probity in public service. *Public Administration Review* 59(1):63-75.
- Grenier, L.** 1998. *Working with indigenous knowledge: a guide for researchers*. Ottawa: IDRC. <[http://www.idrc.ca/en/ev-28703-201-1-DO\\_TOPIC.html](http://www.idrc.ca/en/ev-28703-201-1-DO_TOPIC.html)> 28 July 2008.
- Groeneweg, K., G. Buyu, D. Rombey and B. Minjauw.** 2006. *Livestock farmer field schools: guidelines for facilitation and technical manual*. Nairobi: ILRI.
- Grootaert, C.** 2001. Social capital: the missing link? In: Dekker, P. and E. M. Uslaner. (eds). *Social capital and participation in everyday life*. London: Routledge. pp. 9-29.
- Grootaert, C. and T. Van Bastelaer.** 2001. Understanding and measuring social capital: a synthesis of findings and recommendations from the Social Capital Initiative. World Bank Social Capital Initiative Working Paper no. 24. Washington: The World Bank.
- Guba, E. G. and Y. S. Lincoln.** 1989. *Fourth generation evaluation*. Newbury Park: Sage Publications.
- Guba, E. G. and Y. S. Lincoln.** 2000. Epistemological and methodological bases of Naturalistic inquiry. In: Stufflebeam, D. L, G. F. Madaus and T. Kellaghan (eds). *Evaluation models: viewpoints on educational and human services evaluation*. Dordrecht: Kluwer. pp. 363-381.
- Guba, E. G. and Y. S. Lincoln.** 2008. Paradigmatic controversies, contradictions, and emerging confluences. In: Denzin, N. K. and Y. S. Lincoln. (eds). *The landscape of qualitative research*. 3rd. ed. Thousand Oaks: Sage Publications. pp. 255-286.



- Guèye, E. F. 2009. Small-scale family poultry production: the role of networks in information dissemination to family poultry farmers. *World's Poultry Science Journal* 65:115-124.
- Guislain, P., C. Z. Qiang, B. Lanvin, M. Mingos and E. Swanson. 2006. Overview. In: The World Bank. *Information and communications for development: global trends and policies*. Washington: The World Bank. pp. 3-14.  
<<http://siteresources.worldbank.org/EXTINFORMATIONANDCOMMUNICATIONANDTECHNOLOGIES/Resources/282822-1141851022286/IC4DOverview.pdf>> 12 July 2007.
- Gupta, A. K. 2001. Intellectual property, traditional knowledge and genetic resources: how can Asian countries protect traditional knowledge farmers' rights and access to genetic resources through the implementation or review of the WTO TRIPS agreement. Paper presented at the International Conference on Intellectual Property, the Internet, Electronic Commerce and Traditional Knowledge, Sofia, Bulgaria 29-31 May 2001.  
<[http://www.wipo.int/edocs/mdocs/ip-conf-bg/en/wipo\\_ectk\\_sof\\_01/wipo\\_ectk\\_sof\\_01\\_3\\_9.pdf](http://www.wipo.int/edocs/mdocs/ip-conf-bg/en/wipo_ectk_sof_01/wipo_ectk_sof_01_3_9.pdf)> 16 June 2008.
- Ha, L., R. N. Okigbo and P. Igboaka. 2008. Knowledge creation and dissemination in sub-Saharan Africa. *Management Decision* 46(3):392-405.
- Hafkin, N. J and H. H. Odame. 2002. Gender, ICTs and agriculture. A situation analysis for the 5th Consultative Expert Meeting of CTA's ICT Observatory meeting on gender and agriculture in the information society.  
<[http://www.cta.int/observatory2002/background\\_paper.pdf](http://www.cta.int/observatory2002/background_paper.pdf)> 24 April 2007.
- Haggie, K. 2003. Choosing your knowledge management strategy. *Journal of Knowledge Management Practice* June 2003. <<http://www.tlinc.com/article51.htm>> 19 September 2007.
- Haider, J. and D. Bawden. 2006. Pairing information with poverty: traces of development discourse in LIS. *New Library World* 107(9/10):371-385.
- Hair, J. F., R. P. Bush and D. J. Ortinau. 2003. *Marketing research within a changing information environment*. 2nd ed. Boston: McGraw-Hill Irwin.
- Hall, A. 2007. The origins and implications of using innovation systems perspectives in the design and implementation of agricultural research projects: some personal observations. UNU-MERIT Working Papers 2007-013. Maastricht: United Nations University.
- Hammersley, M. 2008. Troubles with triangulation. In: Bergman, M. M. (ed.) *Advances in mixed methods research*. Los Angeles: Sage Publications. pp. 22-36.
- Hammond, G. K. and G. E. Chapman. 2008. Decision-making in the dairy aisle: maximizing taste, health, cost and family considerations. *Canadian Journal of Dietetic Practice and Research* 69(2):66-70.
- Harris, R. W. 2002. Rural development theories and ICTs.  
<[http://www.bytesforall\\_readers/2002-August/00833.html](http://www.bytesforall_readers/2002-August/00833.html)> 29 March 2007.
- Harris, R. W. 2004. Information and communication technologies for poverty alleviation.  
<<http://eprimers.apdip.net/series/info-economy/poverty.pdf>> 29 March 2007.
- Hart, C. 1998. *Doing a literature review: releasing the social science research imagination*. London: Sage Publications.
- Heck, R. H. 2004. *Studying educational and social policy: theoretical concepts and research methods*. New Jersey: Lawrence Erlbaum Associates.
- Hedges, B. 2004. Sampling. In: Seale, C. (ed.) *Social research methods: a reader*. London: Routledge. pp. 63-72.
- Heeks, R. (ed.) 1999. *Reinventing government in the information age: international practice in IT-enabled public sector reform*. London: Routledge.
- Heeks, R. 2002. Failure, success and improvisation of information systems projects in developing countries. Development Informatics Working Paper Series no. 11.
- Heeks, R. 2007. e-Africa and m-Africa: how can ICTs deliver?  
<[http://www.odi.org.uk/events/G8\\_07/opinions/heeks.pdf](http://www.odi.org.uk/events/G8_07/opinions/heeks.pdf)> Accessed 6 September 2007.
- Heemskerk, W. and B. Wennink. 2004. Building social capital for agricultural innovation: experiences with farmer groups in Sub-Saharan Africa. KIT Development Policy and Practice Bulletin 368. Amsterdam: Royal Tropical Institute (KIT).

- Hemp, C.** 2005. The Chagga home gardens – Relict areas for endemic Saltatoria species (Insecta: Orthoptera) on Mount Kilimanjaro. *Biological Conservation* 125:203-209.
- Hennessy, D. A.** 1996. Information asymmetry as a reason for food industry vertical integration. *American Journal of Agricultural Economics* 78:1034-1043.
- Herr, K. and L. Anderson.** 2005. *The action research dissertation: a guide for students and faculty*. Thousand Oaks: Sage Publications.
- Heron, J. and P. Reason.** 1997. A participatory inquiry paradigm. *Qualitative Inquiry* 3(3):274-294.
- Hesser-Bibe, S. N.** 2010. *Mixed methods research: merging theory with practice*. New York: Guilford Press.
- Hildreth, P. J. and C. Kimble.** 2002. The duality of knowledge. *Information Research* 8(1) Paper no. 142 <<http://InformationR.net/ir/8-1/paper142.html>> 10 February 2008.
- Hildreth, P. J., P. Wright and C. Kimble.** 1999. Knowledge management: are we missing something? In: Brooks, L. and C. Kimble. (eds). *Information systems - the next generation. Proceedings of the 4th UKAIS Conference*, University of York, McGraw Hill. pp. 347-356. <<http://www.cs.york.ac.uk/mis/>> 5 July 2007.
- Hirst, J., J. J. Overton, B. Allen and Y. Byron.** (eds). 1988. *Small-scale agriculture*. Canberra: Australia Commonwealth Geographic Bureau.
- Hoffman, J. J., M. L. Hoelscher and K. Sherif.** 2005. Social capital, knowledge management and sustained superior performance. *Journal of Knowledge Management* 9(3):93-100.
- Hoffmann, S. and B. Rischkowsky.** 2005. Integrating the indigenous knowledge of Borana pastoralists into rangeland management strategies in Southern Ethiopia. *IK Notes* no. 81 June. Washington: The World Bank.
- Hoffmann, V., K. Probst and A. Christinck.** 2007. Farmers and researchers: how can collaborative advantages be created in participatory research and technology development? *Agriculture and Human Values* 24:355–368.
- Holden, N. J. and H. F. O. Von Kortzfleisch.** 2004. Why cross-cultural knowledge transfer is a form of translation in more ways than you think. *Knowledge and Process Management* 11(2):127-136.
- Holland, G. A.** 2006. Associating social constructionism and extended cognition in information studies. *Journal of Documentation* 62(1):91-100.
- Holland, J. and J. Blackburn.** 1998. (eds). *Whose voice? Participatory research and policy change*. London: Intermediate Technology Publications.
- Holloway, G., C. Nicholson, C. Delgado, S. Staal and S. Ehui.** 2000. How to make a milk market: a case study from the Ethiopian highlands. ILRI Working Paper no. 28. Addis Ababa: ILRI.
- Holmes, R.** 1999. Gender analysis of telecentre evaluation methodology. In: Gomez, R. and P. Hunt. (eds). *Telecentre evaluation: a global perspective*. Ottawa: IDRC. pp. 139-148.
- Hooton, N., J. Nyangaga, H. Kinyanjui and G. Agili.** 2006. How an improved knowledge and information system can support productivity and livelihoods in the smallholder dairy sector. In: *Proceedings of the 9th KARI Biennial Scientific Conference. Theme: Agricultural research for improved productivity and livelihoods*. 8-12 November 2004. Nairobi: KARI. pp. 544-548.
- Horstkotte-Wesseler, G., M. Maredia, D. Byerlee and G. Alex. with inputs from J. Anderson, M-H. Collion, M. Gautam, J. P. Gittinger, R. D. Hunt, J. Kangasniemi, M. McMahon, R. Nelson, D. Nielson, M. Petit, T. P. N. Sinha, C. Ranade, D. Umali-Deininger and W. Zijp.** 2000. Ex ante economic analysis in AKIS projects: methods and guidelines for good practice. Washington: The World Bank.
- Horton, F. W. Jr.** 2007. *Understanding information literacy: a primer*. Paris: UNESCO.
- Hoskisson, R. E., M. A. Hitt, W. P. Wan and D. Yiu.** 1999. Theory and research in strategic management: swings of a pendulum. (Yearly review of management). *Journal of Management* 25(3):417-456.
- Hubbard, D. W.** 2010. *How to measure anything: finding the value of intangibles in business*. 2nd ed. New Jersey: John Wiley and Sons.
- Hunt, S. D.** 1991. Positivism and paradigm dominance in consumer research: toward critical pluralism and rapprochement. *Journal of Consumer Research* 18:32-42.
- Hunter, K., S. Hari, C. Egbu and J. Kelly.** 2005. Grounded theory: its diversification and



- application through two examples from research studies on knowledge and value management. *Electronic Journal of Business Research Methodology* 3(1):57-68.
- Huppi, M. and G. Feder.** 1998. The role of groups and credit cooperatives in rural lending. World Bank Policy, Planning and Research Working Papers 284. Washington: The World Bank.
- Hurtubise, R.** 1984. *Managing information systems: concepts and tools*. West Hartford: Kumarian Press.
- IBM.** 2001. Sowing the seeds of organic knowledge management at English nature. <[http://www.cognitive-edge.com/ceresources/articles/47\\_engnatkm.pdf](http://www.cognitive-edge.com/ceresources/articles/47_engnatkm.pdf)> 20 November 2007.
- Ibui, A. K.** 2007. Indigenous knowledge, belief and practice of wild plants among the Meru of Kenya: past and present human plant relations in East Africa. PhD. diss. Leiden: Leiden University.
- ICT Village.** 2007. Digital village enterprises. <<http://www.ictvillage.com/DVCatDetails.asp?DCatID=4>> 20 November 2007.
- ID21.** 2006. Achieving food security: what next for sub-Saharan Africa? ID21 Insights April 2006. <<http://www.id21.org/insights/insights61/insights61.pdf>> 12 June 2007.
- Idiegbeyan-Ose, J. D. B. M. and T. U. Akpoghome.** 2009. Information as an effective tool in rural development. *International Journal of Library and Information Science* 1(3):022-028.
- Iibuodo, J. P.** 2003. The role and use of rural radio in Africa. In: Gerard, B. (ed.) *The one to watch – radio, new ICTs and interactivity*. Rome: FAO. <<ftp://ftp.fao.org/docrep/fao/006/y4721e/y4721e00.pdf>> 29 March 2007.
- Ikoja-Odongo, R. and D. N. Ocholla.** 2003. Information needs and information-seeking behaviour of artisan fisher folk of Uganda. *Library and Information Science Research* 25:89-105.
- Ikoja-Odongo, R. and J. Mostert.** 2006. Information seeking behaviour: a conceptual framework. *South African Journal of Library and Information Science* 72(3):145-158.
- International Centre for Insect Physiology and Ecology (ICIPE).** 2005. Development of private sector service providers for the horticultural industry in Kenya. *ICIPE Biennial Scientific Report 2004-2005*. Nairobi: ICIPE. pp. 94-98. <[http://www.icipe.org/bsr/pdf/plant\\_health/horticultural\\_crops\\_pests\\_05.pdf](http://www.icipe.org/bsr/pdf/plant_health/horticultural_crops_pests_05.pdf)> 3 April 2007.
- International Centre for Insect Physiology and Ecology (ICIPE).** 2009. Push-pull: a novel conservation agriculture technology for integrated pest and soil fertility management in cereal farming systems. <<http://www.push-pull.net/>> 16 November 2009.
- International Council for Science (ICSU).** 2002. Science, traditional knowledge and sustainable development. ICSU Series on Science for Sustainable Development no. 4. Paris: ICSU and UNESCO.
- International Development Research Centre (IDRC).** 2004. Electronic Delivery of Agricultural Information to Rural Communities in Uganda. <[http://www.idrc.ca/en/ev-83071-201\\_100206-1-IDRC\\_ADM\\_INFO.html](http://www.idrc.ca/en/ev-83071-201_100206-1-IDRC_ADM_INFO.html)> 23 April 2008.
- International Fund for Agricultural Development (IFAD).** 1989. *Women: the roots of rural development*. Rome: IFAD.
- International Fund for Agricultural Development (IFAD).** 2001. *Rural poverty report 2001: the challenge of ending rural poverty*. Oxford: Oxford University Press.
- International Fund for Agricultural Development (IFAD).** 2002a. *Assessment of rural poverty: Eastern and Southern Africa*. Rome: IFAD.
- International Fund for Agricultural Development (IFAD).** 2002b. *Challenges in rural development and poverty alleviation in Eastern and Southern Africa: the role of civil society and development institutions*. Rome: IFAD. <<http://www.ifad.org/ngo/events/pf/reports/session3.pdf>> 11 May 2007.
- International Fund for Agricultural Development (IFAD).** 2003. Fighting rural poverty. The role of ICTs. <<http://www.ifad.org/events/wsis/factsheet/e.pdf>> 20 November 2007.
- International Institute of Rural Reconstruction (IIRR).** 1996. *Recording and using indigenous knowledge: a manual*. Silang: IIRR.
- International Institute of Rural Reconstruction (IIRR).** 1998. *Sustainable agriculture extension manual for Eastern and Southern Africa*. Nairobi: IIRR.
- International Institute of Rural Reconstruction (IIRR).** 2000. *Going to scale: can we bring more benefits to more people more quickly?* Silang: IIRR.

- International Telecommunication Union (ITU).** 2009. Information society statistical profiles 2009. Africa. Geneva: ITU. <[http://www.itu.int/ITU-D/ict/material/ISSP09-AFR\\_final-en.pdf](http://www.itu.int/ITU-D/ict/material/ISSP09-AFR_final-en.pdf)> 10 February 2010.
- Irick, M. L.** 2007. Managing tacit knowledge in organizations. *Journal of Knowledge Management Practice* 8(3). <<http://www.tlainsc.com/article139.htm>> 24 March 2008.
- Irivwieri, J. W.** 2007. Information needs of illiterate female farmers in Ethiopia East Local Government area of Delta State. *Library Hi Tech News* 9/10:38-42.
- Ismail, Z. and T. Fakir.** 2004. Trademarks or trade barriers? Indigenous knowledge and the flaws in the global IPR system. *International Journal of Social Economics* 31(1/2):173-194.
- Jain, P.** 2006. Empowering Africa's development using ICT in a knowledge management approach. *The Electronic Library* 24(1):51-67.
- Janes, J.** 1999. On research: survey construction. *Library Hi Tech* 17(3):321-325.
- Janesick.** 1994. The dance of qualitative research design: metaphor, methodolatry, and meaning. In: Denzin, N. K. and Y. S. Lincoln. *Handbook of qualitative research*. Thousand Oaks: Sage Publications. pp. 209-219.
- Järvelin, K. and T. D. Wilson.** 2003. On conceptual models for information seeking and retrieval research. *Information Research* 9(1) Paper 163. <<http://informationr.net/ir/9-1/paper163.html>> 19 July 2007.
- Jensen, K. L., B. C. English and R. J. Menard.** 2009. Livestock farmers' use of animal or herd health information sources. *Journal of Extension* 47(1):1-10.
- Jensen, M.** 1997. Policy constraints to electronic information sharing in developing countries. *The Internet* (Nov-Dec):13-15,41.
- Jensen, M.** 2006. Open access lowering the costs of international bandwidth in Africa. APC Issue Papers. <<http://rights.apc.org/papers.shtml>> 27 April 2008.
- Jick, T. D.** 1979. Mixing qualitative and quantitative methods: triangulation in action. *Administrative Science Quarterly* 24(4):602-611.
- Jiggins, J., R. K. Samanta and J. E. Olawoye.** 1997. Improving women farmers' access to extension services. In: Swanson, B. E., R. P. Bentz and A. J. Sofranko. (eds). *Improving agricultural extension: manual*. Rome: FAO. <<http://www.fao.org/docrep/W5830E/w5830e0b.htm#TopOfPage>> 18 October 2007.
- Johnson, B. and L. A. Turner.** 2003. Data collection strategies in mixed methods research. In: Tashakkori, A. and C. Teddlie. (eds). 2003. *Handbook of mixed methods in social and behavioral research*. Thousand Oaks: Sage Publications. pp. 297-319.
- Johnson, B. and L. Christensen.** 2008. *Educational research: quantitative, qualitative and mixed approaches*. 3rd ed. Thousand Oaks: Sage Publications.
- Jones, G. E. and C. Garforth.** 1997. The history, development and future of agricultural extension. In: Swanson, B. E., R. P. Bentz and A. J. Sofranko. (eds). *Improving agricultural extension: manual*. Rome: FAO. <<http://www.fao.org/docrep/W5830E/w5830e00.HTM>> 18 October 2007.
- Jones, L. and Somekh, B.** 2005. Observation. In: Somekh, B. and C. Lewin. (eds). *Research methods in the social sciences*. London: Sage Publications. pp. 138-154.
- Jones, M.** 2006. An agricultural research perspective on poverty, innovation policies and agricultural development in sub-Saharan Africa. Paper presented at the EGDI Policy, Poverty and Agricultural Development in Sub-Saharan Africa Workshop. 8-9 March 2006. Frösundavik, Sweden. <[http://www.egdi.gov.se/word/monty\\_jones\\_jan05.doc](http://www.egdi.gov.se/word/monty_jones_jan05.doc)> 7 April 2007.
- Joranson, K.** 2008. Indigenous knowledge and the knowledge commons. *The International Information and Library Review* 40:64-72.
- Jorgensen, D. L.** 1989. *Participant observation: a methodology for human studies*. Applied Social Research Methods Series Volume 15. London: Sage Publications.
- Juma, C.** 2005. Reinventing growth. In: Juma, C. (ed.) 2005. *Going for growth: science, technology and innovation in Africa*. London: Smith Institute. pp. 10-22.
- Juma, C. and L. Yee-Cheong.** 2005. *Innovation: applying knowledge in development*. UN Millennium Project, Task Force on Science, Technology and Innovation. London: Earthscan.
- Kabutha, C.** 1998. Winrock International and its approach to gender equity in the fields of agriculture and environment. In: Curry, J., M. Kooijman and H. Recke. (eds).

- Institutionalising gender in agricultural research: experiences from Kenya*. Proceedings of the Gender Conference, KARI Headquarters, Nairobi, Kenya 5-7 October 1998. Nairobi: KARI. pp. 221-224.
- Kagwe, M.** 2007. Address by Hon. Mutahi Kagwe, Minister for Information and Communications, during the official opening of The East African Marine System (TEAMS) briefing meeting at the Kenya College of Communications Technology (KCCT), 4 July 2007.  
<<http://www.cck.go.ke/speeches/>> 20 November 2007.
- Kahan, D.** 2008. *Economics for market-oriented farming: farm management extension guide*. Rome: FAO.
- Kalusopa, T.** 2005. The challenges of utilizing information communication technologies (ICTs) for the small-scale farmers in Zambia. *Library Hi Tech* 23(3):414-424.
- Kamau, G.** 2007. Researching with farmers: a study of KARI participatory research practices in context. PhD. thesis. Wageningen: Wageningen University.
- Kamau, G., R. Kiome and J. Wamuongo.** 2000. Scaling up of agricultural technologies: agricultural technologies and information response initiative and the role of extension. In: Mureithi, J. G., C. K. K. Gachene, F. N. Munyekho, M. Onyango, L. Mose and O. Magenya. (eds). *Participatory technology development for soil management by small holders in Kenya*. Proceedings of the 2nd Scientific conference of the Soil Management and Legume Research Network projects. Nairobi: KARI. pp. 545-551.
- Kang, B. T, and F. K. Akinnifisib.** 2000. Agroforestry as an alternative land-use production system for the tropics. *Natural Resources Forum* 24:137-151.
- Kaniki, A. M.** 1989. Agricultural information needs in Zambia: a study of two-way information flow. PhD. thesis. Pittsburg: University of Pittsburg.
- Kaniki, A. M.** 1991. Information seeking and information providers among Zambian farmers. *Libri* 41(3):147-164.
- Kaniki, A. M.** 1994a. Community resource centres and resource centre forums in the transformation and post-transformation era in South Africa. *African Journal of Library Archives and Information Science* 4(1):27-54.
- Kaniki, A. M.** 1994b. Specialist training for information provision to rural communities in South Africa. *Innovation* 9:35-42.
- Kaniki, A. M.** 1995a. Agricultural information user populations and critical tasks in Africa. In: Aina, L. O., A. M. Kaniki and J. B. Ojiambo. (eds). *Agricultural information in Africa*. Ibadan: Third world Information Services. pp. 12-30.
- Kaniki, A. M.** 1995b. Exploratory study of information needs in the KwaNgwanase (Natal) and Qumbu (Transkei) communities of South Africa. *South African Journal of Library and Information Science* 65(1):9-18.
- Kaniki, A. M.** 2001. Community profiling and needs assessment. In: Stilwell, C., A. Leach and S. Burton. (eds). *Knowledge, information and development: an African perspective*. Pietermaritzburg: University of Natal, School of Human and Social Studies. pp. 187-199.
- Kaniki, A. M.** 2006. Doing an information search. In: Terre Blanche, M., K. Durrheim and D. Painter. *Research in practice: applied methods for the social sciences*. Cape Town: University of Cape Town. pp. 19-32.
- Kaniki, A. M. and M. E. K. Mphahlele.** 2002. Indigenous knowledge for the benefit of all: can knowledge management principles be used effectively? *South African Journal of Libraries and Information Science* 68(1):1-15.
- Kanté, A., F. Dunkel, A. Williams, S. Magro, H. Traoré and A. Camara.** 2009. Communicating agricultural and health-related information in low literacy communities: a case study of villagers served by the Bougoula communie in Mali. In: 2009 AIAEE Proceedings of the 25<sup>th</sup> annual Meeting, Inter Continental San Juan Resort, Puerto Rico. pp. 284-291.
- Kanungo, S.** 2004. On the emancipatory role of rural information systems. *Information Technology and People* 17(4):407-422.
- Kapange, B.** 2006. Agricultural information: improving access to remote areas in Tanzania. *IAALD Quarterly Bulletin* LI(3/4):152-158.
- Kaplan, B. and D. Duchon.** 1988. Combining qualitative and quantitative methods in information systems research: a case study. *Management Information System Quarterly* 12(4):571-586.



- Karamagi Akiiki, E.** 2006. Towards improving farmers' livelihoods through exchange of local agricultural content in rural Uganda. *Knowledge Management for Development Journal* 2(1):68-77.
- Karamagi Akiiki, E.** 2008. ICT tools in action. *Spore* 133:16.
- Karami, E.** 2006. Prosperity and poverty in a globalised world. Challenges for agricultural research. Poverty alleviation in developing countries: principles for agricultural knowledge and information system. Tropentag, October 11-13, 2006, Bonn, Germany.  
<[http://www.tropentag.de/2006/abstracts/links/Karami\\_B7i7jdYV.php](http://www.tropentag.de/2006/abstracts/links/Karami_B7i7jdYV.php)> 23 April 2007. (Abstract).
- Karanja, T. and J. O. Ouma.** 2006. Agricultural knowledge and information system (AKIS): analysis of linkages among actors in Meru Central district. In: Proceedings of the 9th KARI Biennial Scientific Conference. Theme: Agricultural research for improved productivity and livelihoods. 8-12 November 2004. Nairobi: KARI. pp. 193-198.
- Kari, J.** 1998. Making sense of sense making: from metatheory to substantive theory in the context of paranormal information seeking. Paper presented at Nordis-Net workshop (Meta)theoretical stands in studying library and information institutions: individual, organizational and societal aspects, 12-15 November 1998, Oslo, Norway.
- Kariuki, I. M., G. A. Obare and E. A. Birachi.** 2006. Are informal market linkages in developing countries transaction cost sensitive? Evidence from procurement of smallholders' produce by brokers in Kenya. *Journal of Applied Sciences* 6(4):838-842.
- Karlsson, J.** 1995. Methods of information provision to rural communities in South Africa. In: Johansson, E. (ed.) *Seminar on information provision to rural communities in Africa*. Proceedings of the seminar held in Gaborone, Botswana, 22-25 June 1994. Uppsala: International Federation of Library Associations and Institutions. pp. 47-57.
- Kawachi, I.** 2000. Social capital.  
<<http://www.macses.ucsf.edu/Research/Social%20Environment/notebook/capital.html#Measurement>> 15 January 2008.
- Kawalek, J. and D. Hart.** 2003. Towards process modelling in 'knowledge management' work. *Electronic Journal on Knowledge Management* 1(2):93-102.
- Kayabwe, S. K. and R. Kibombo.** 1999. Buwama and Nabweru multipurpose community telecentres: a baseline survey report. Nairobi: IDRC.
- Keene, A.** 2000. Complexity theory: the changing role of leadership. *Industrial and Commercial Training* 32(1):15-18.
- Kelliher, F.** 2005. Interpretivism and the pursuit of research legitimization: an integrated approach to single case design. *Electronic Journal of Business Research* 3(2):123-132.
- Kelly, G.** 1963. *A theory of personality: the psychology of personal constructs*. New York: Norton.
- Kelly, K.** 2006a. From encounter to text: collecting data in qualitative research. In: Terre Blanche, M., K. Durrheim and D. Painter. (eds). *Research in practice: applied methods for the social sciences*. 2nd ed. Cape Town: University of Cape Town. pp. 285-319.
- Kelly, K.** 2006b. Calling it a day: reaching conclusions in qualitative research. In: Terre Blanche, M., K. Durrheim and D. Painter. (eds). *Research in practice: applied methods for the social sciences*. 2nd ed. Cape Town: University of Cape Town. pp. 370-387.
- Kemper, E. A., S. Stringfield and C. Teddlie.** 2003. Mixed methods sampling strategies in social science research. In: Tashakkori, A. and C. Teddlie. (eds). 2003. *Handbook of mixed methods in social and behavioral research*. Thousand Oaks: Sage Publications. pp. 273-296.
- Kennedy, L. A.** 2001. Community involvement at what cost? - Local appraisal for a pan-European nutrition promotion programme in low-income neighbourhoods. *Health Promotion International* 16(1):34-45.
- Kenya Agricultural Commodity Exchange (KACE).** 2007. Kenya Agricultural Commodity Exchange. <<http://www.kacekenya.com/>> 15 March 2007.
- Kenya Agricultural Information Network (KAINet).** 2009. Promoting agricultural information and technologies through networking.  
<<http://www.asareca.org/resources/reports/KAINetlaunch.pdf>> 15 April 2009.

- Kenya Agricultural Research Institute (KARI).** 2001. Agricultural Technology and Information Response Initiative (ATIRI) booklet. Nairobi: Kenya.  
<<http://www.kari.org/ATIRI/ATIRIBklet2001.htm>> 8 November 2007.
- Kenya Agricultural Research Institute (KARI).** 2007. Agricultural Technology and Information Response Initiative <<http://www.kari.org/ATIRI/ATIRI.htm>> 16 June 2007.
- Kenya Dairy Board.** 2010. Marketing information – milk intakes.  
<[http://www.kdb.co.ke/index.php?option=com\\_content&view=article&id=67&Itemid=86](http://www.kdb.co.ke/index.php?option=com_content&view=article&id=67&Itemid=86)> 30 June 2010.
- Keogh, E.** 2004. Designing surveys. In: Patel, B. K. *The green book: a guide to effective graduate research in African agriculture, environment, and rural development*. Kampala: African Crop Science Society. pp. 155-169.
- Kerlinger, F. N.** 1985. *Foundations of behavioral research*. 3rd ed. New York: Holt Rinehart and Winston.
- Kerrets, M.** 2004. ICT regulation and policy at a crossroads: a case study of the licensing process in Kenya. *Southern African Journal of Information and Communication* 5:49-63.
- Kibaara, B., J. Ariga, J. Olwande and T. S. Jayne.** 2009. Trends in Kenyan agricultural productivity: 1997-2007. Working Paper Series no. 31/2008. Nairobi: Tegemeo Institute of Agricultural Policy and Development.
- Kibwana, O. T.** 2001. Forging partnership between farmers, extension and research in Tanzania. In: Reij, C. and A. Waters-Bayer. (eds). *Farmer innovation in Africa: a source of inspiration for agricultural development*. London: Earthscan. pp. 49-57.
- Kidane, W., M. Maetz and P. Dardel.** 2006. Food security and agricultural development in sub-Saharan Africa. Building a case for more public support. Main report. Rome: FAO  
<<ftp://ftp.fao.org/docrep/fao/009/a0627e/a0627e.pdf> 6> September 2007.
- Kilpatrick, S.** 1999. Managing farming: how farmers learn. Final report. Publication no. 99/74. Loundeston: Rural Industries Research and Development Corporation.
- Kilpatrick, S. and R. Bell.** 1998. Support networks and trust: how social capital facilitates learning outcomes for small businesses. Paper D17/1998 in CRLRA Discussion Paper Series. Launceston: University of Tasmania. Centre of Research and Learning in Regional Australia.
- Kimenye, L. N.** 1998. Assessment of technology dissemination and utilisation by women and men farmers: a case study of Embu and Mbeere districts. In: Curry, J., M. Kooijman and H. Recke. (eds). *Institutionalising gender in agricultural research: experiences from Kenya*. Proceedings of the Gender Conference, KARI Headquarters, Nairobi, Kenya 5-7 October 1998. Nairobi: KARI. pp. 201-214.
- Kimenye, L. N.** 2005. Promoting farm/non-farm linkages: a case study of French bean processing in Kenya. In: Davis, B. (ed.) *Promoting farm/non-farm linkages for rural development: case studies from Africa and Latin America*. Rome: FAO. pp. 145-170.
- Kinengyere, A. A.** 2007. The effect of information literacy on the utilization of electronic information resources in selected academic and research institutions in Uganda. *The Electronic Library* 25(3):328-341.
- Kingiri, A. and S. Ayele.** 2009. Towards a smart biosafety regulation: the case of Kenya. *Environment and Biosafety Research* 2009:1-9.
- Kiome, R.** 2009. Food security in Kenya. Nairobi: Ministry of Agriculture.  
<[http://www.reliefweb.int/rw/RWFiles2009.nsf/FilesByRWDUnidFilename/SNAA-7WG3UR-full\\_report.pdf/\\$File/full\\_report.pdf](http://www.reliefweb.int/rw/RWFiles2009.nsf/FilesByRWDUnidFilename/SNAA-7WG3UR-full_report.pdf/$File/full_report.pdf)> 24 April 2010.
- Kiondo, E.** 1998. Access to gender and development information by rural women in the Tanga region, Tanzania. PhD. thesis. Pietermaritzburg: University of Natal.
- Kiplang'at, J.** 1999. An analysis of the opportunities for information technology in improving access, transfer and use of agricultural information in the rural areas of Kenya. *Library Management* 20(2):115-127.
- Kiplang'at, J. and D. N. Ocholla.** 2005. Diffusion of information and communication technologies in communication of agricultural information among agricultural researchers and extension workers in Kenya. *South African Journal of Library and Information Science* 71(3):234-246.

- Kiptot, E., P. Hebinck, S. Franzel and P. Richards.** 2007. Adopters, testers or pseudop-adopters? Dynamics of the use of improved tree fallows by farmers in Western Kenya. *Agricultural Systems* 94:509-519.
- Kiptot, E., S. Franzel, P. Hebinck and P. Richards.** 2006. Sharing seed and knowledge: farmer to farmer dissemination of agroforestry technologies in Western Kenya. *Agroforestry Systems* 68(3):167-179.
- Kirk, J.** 1997. Managers' use of information: a grounded theory approach. In: Vakkari, T., R. Savolainen and B. Dervin. (eds). *Information seeking in context*. Proceedings of an International Conference on Research in Information Needs, Seeking and Use in Different Contexts. 14-16 August, 1996, Tampere, Finland. London: Taylor Graham. pp. 257-267.
- Kizilaslan, N.** 2006. Agricultural information systems: a national case study. *Library Review* 55(8):497-507.
- Klein, H. K.** 2004. Seeking the new and the critical in critical realism: déjà vu? *Information and Organization* 14:123-144.
- Klerkx, L.** 2008. Matching demand and supply in the Dutch agricultural knowledge infrastructure: the emergence and embedding of new intermediaries in an agricultural innovation system in transition. PhD. thesis. Wageningen: Wageningen University.
- Klerkx, L. and C. Leeuwis.** 2008. Matching demand and supply in the agricultural knowledge infrastructure: experiences with innovation intermediaries. *Food Policy* 33:260-276.
- Klerkx, L. and C. Leeuwis.** 2009. Shaping collective functions in privatized agricultural knowledge and information systems: the positioning and embedding of a network broker in the dutch dairy sector. *Journal of Agricultural Education and Extension* 15(1):81-105.
- Kloppenborg, J.** 2009. Social theory and the de/reconstruction of agricultural science: local knowledge for an alternative agriculture. In: Henderson, G. and M. Waterstone. (eds). *Geographic thought: a praxis perspective*. From *Rural Sociology* 56(4):519-548. Oxon: Routledge.
- Knox, K.** 2004. A researcher's dilemma – philosophical and methodological pluralism. *Electronic Journal of Business Research* 2(2):119-128.
- Koblik, K. and L. K. Aguiar.** 2008. Farmers' decision-making process for purchasing agricultural equipment: an insight into the new Russian economy. *Acta Horticulturae* 794:165-171.
- Kohlbacher, F. and M. O. B. Krähe.** 2007. Knowledge creation and transfer in a cross-cultural context- empirical evidence from Tyco flow control. *Knowledge and Process Management* 14(3):169-181.
- Kooijman, M. and A. N. Mbaabu.** 1998. Institutionalising gender issues in agricultural technology development and transfer. The case of the Kenya Agricultural Research Institute. In: Curry, J., M. Kooijman and H. Recke. (eds). *Institutionalising gender in agricultural research: experiences from Kenya*. Proceedings of the Gender Conference, KARI Headquarters, Nairobi, Kenya 5-7 October 1998. Nairobi: KARI. pp. 23-33.
- Koskinen, K. U.** 2003. Evaluation of tacit knowledge utilization in work units. *Journal of Knowledge Management* 7(5):67-81.
- Kothari, B.** 2002. Theoretical streams in marginalized people's knowledge(s): systems, asystems, and subaltern knowledge(s). *Agriculture and Human Values* 19:225-237.
- Kothari, C. R.** 2004. *Research methodology: methods and techniques*. 2nd ed. New Delhi: New Age International.
- Koutsouris, A.** 2008. Innovating towards sustainable agriculture: a Greek case study. *Journal of Agricultural Extension* (3):203-215.
- Koutsouris, A. and D. Papadopoulos.** 1998. Extension functions and farmers' attitudes in Greece. In: Röling, N. G. and M.A. E. Wagemakers. (eds). *Facilitating sustainable agriculture: participatory learning and adaptive management in times of environmental uncertainty*. Cambridge: Cambridge University Press. pp. 88-101.
- Krathwohl, D. R.** 2002. A revision of bloom's taxonomy: an overview. *Theory into Practice* 41(4):212-218.
- Kristjanson, P., R. S. Reid, N. Dickson, W. C. Clark, D. Romney, R. Puskur, S. MacMillan and D. Grace.** 2009. Linking international agricultural research knowledge with action for sustainable development. *PNAS* 106(13):5047-5052.  
<[www.pnas.org/cgi/doi/10.1073/pnas.0807414106](http://www.pnas.org/cgi/doi/10.1073/pnas.0807414106)> 20 March 2010.

- Krueger, R. A. and M. A. Casey.** 2000. *Focus groups: a practical guide for applied research*. 3rd ed. London: Sage Publications.
- Kuhn, T. S.** 1970. *The structure of scientific revolutions*. 2nd ed. Enlarged. Chicago: University of Chicago Press.
- Kumar, R.** 2005. *Research methodology: a step-by-step guide for beginners*. 2nd ed. London: ITDG Publishing.
- Kumar, S.** 2002. *Methods for community participation: a complete guide for practitioners*. London: ITDG Publishing.
- Kurtz, C. F. and D. J. Snowden.** 2003. The new dynamics of strategy: Sense-making in a complex and complicated world. *IBM Systems Journal* 42 (3):462-483.
- Kwake, A. K.** 2006. Demystifying ICT diffusion and use among rural women in Kenya. Unpublished paper presented to ProLISSA 2006 Conference.
- Kwake, A. W.** 2007. The role of information and communication technologies in harnessing information for women in rural development: case studies of South Africa and Kenya. PhD. thesis. KwaDlangezwa: University of Zululand.
- Kwake, A. W. and D. N. Ocholla.** 2007. The feasibility of ICT diffusion amongst African rural women: a case study of South Africa and Kenya. *International Review of Information Ethics* 7(09):29-46. <[http://www.i-r-i-e.net/inhalt/007/irie\\_007\\_full.pdf](http://www.i-r-i-e.net/inhalt/007/irie_007_full.pdf)> 26 January 2010.
- La Trobe, H.** 2001. Farmers' markets: consuming local rural produce. *International Journal of Consumer Studies* 25(3):181-192.
- Lallana, E. C. and M. N. Uy.** 2003. The information age. The ASEAN Taskforce. UNDP APDIP. <<http://www.apdip.net/publications/iespprimers/eprimer-infoage.pdf>> 23 March 2008.
- Lamoral, D.** 2001. An evaluation of information provision at the Institute for Commercial Forestry Research, South Africa: the findings of an information audit. *Journal of Librarianship and Information Science* 33(4):177-190.
- Landry, R., N. Amara and M. Lamari.** 2001. Social capital, innovation and public policy. *Canadian Journal of Policy Research* 2(1):73-79.
- Larson, R. R.** 2005. Information life cycle. A model of the social aspects of digital libraries. <<http://www.sims.berkeley.edu/courses/is202/f98/Lecture2/index.htmS>> 12 June 2007.
- Laurent, C., M. Cerf and P. Labarthe.** 2006. Agricultural extension services and market regulation: learning from a comparison of six EU countries. *The Journal of Agricultural Education and Extension* 12(1):5-16.
- Lauriol, J.** 2006. Proposals for designing and controlling a doctoral research project in management sciences. *The Electronic Journal of Business Research Methods* 4(1):31-38.
- Lave, J. and E. Wenger.** 1991. *Situated learning: legitimate peripheral participation*. Cambridge: Cambridge University Press.
- Lawson, R., J. Guthrie, A. Cameron and W. C. Fischer.** 2008. Creating value through cooperation: an investigation of farmers' markets in New Zealand. *British Food Journal* 110(1):11-25.
- Laycock, M.** 2005. Collaborating to compete: achieving effective knowledge sharing in organizations. *The Learning Organization* 12(6):523-538.
- Leach, A.** 1999. The provision of information to adults in rural KwaZulu-Natal, South Africa, by non-governmental organisations. *Libri* 49:71-89.
- Leach, A.** 2001a. Information provision in a rural context: the perspectives of rural adults. *South African Journal of Library and Information Science* 67(2):51-62.
- Leach, A.** 2001b. "The best thing is communicating verbally:" NGO information provision in rural KwaZulu-Natal and some observations relating to library and information services. In: Stilwell, C., A. Leach and S. Burton. (eds). *Knowledge, information and development: an African perspective*. Pietermaritzburg: University of Natal, School of Human and Social Studies. pp. 164-186.
- Leathers, H. D. and M. Smale.** 1991. A Bayesian approach to explaining sequential adoption of components of a technological package. *American Journal of Agricultural Economics* 73(3):734-742.
- Leckie, G. J.** 1996. Female farmers and the social construction of access to agricultural information. *LISR* 18:297-321.



- Leedy, P. D. and J. E. Ormrod.** 2005. *Practical research: planning and design*. 8th ed. New Jersey: Pearson Education International.
- Lele, U., J. Jules, E. Terry, E. Trigo and M. Klousia.** 2010. Transforming agricultural research for development. Report on the Global Conference on Agricultural Research (GCARD) 2010 28-31 March, 2010, Montpellier, France.  
<<http://www.fao.org/docs/eims/upload//273759/GAT%20Report%20for%20GCARD%202010%20-%20Version%2011.0.pdf>> 10 May 2010.
- Lemlem, A.** 2009. It works to join hands, milk cooperatives in Northern Ethiopia make a difference. *Kilimo Endelevu Africa* 1(1):17-18.
- Lesaoana-Tshabalala, B. V.** 2003. Agricultural information needs and resources available to agriculturalists and farmers in a developing country with special reference to Lesotho. M. A. thesis. Pretoria: University of Pretoria <<http://etd.rau.ac.za/theses/available/etd-03242004-125946/restricted/ThabalaThesesFinal.pdf>> 2 April 2007.
- Letiche, H.** 2000. Phenomenal complexity theory as informed by Bergson. *Journal of Organizational Change Management* 13(6):545-557.
- Lewin, C.** 2005. Elementary quantitative methods. In: Somekh, B. and C. Lewin. (eds). *Research methods in the social sciences*. London: Sage Publications. pp. 215-225.
- Lewin, K.** 1936. *Principles of topological psychology*. New York: McGraw-Hill.
- Lewis, J. A.** 2008. The power of knowledge: information transfer and açai intensification in the peri-urban interface of Belém, Brazil. *Agroforestry Systems* 74:293-302.
- Lewis, R.** 1994. From chaos to complexity: implications for organizations. *Executive Development* 7(4):16-17.
- Lewis, R. A.** 2002. *CRC dictionary of agricultural sciences*. London: CRC Press.
- Lewis, J.** 2003. Design issues. In: Ritchie, J. and J. Lewis. (eds). *Qualitative research practice: a guide for social science students and researchers*. London: Sage Publications. pp. 47-76.
- Lewis, S.** 2010. Research alone won't drive agricultural development.  
<<http://www.scidev.net/en/agriculture-and-environment/editorials/research-alone-won-t-drive-agricultural-development-1.html>> 10 May 2010.
- Lewis, J. and J. Ritchie.** 2003. Generalising from qualitative research. In: Ritchie, J. and J. Lewis. (eds). *Qualitative research practice: a guide for social science students and researchers*. London: Sage Publications. pp. 263-286.
- Liebowitz, J. (ed.)** 1999. *Knowledge management handbook*. Boca Raton: CRC Press.
- Lievrouw, L. A.** 1988. Four programs of research in scientific communication. *Knowledge in Society* 1(2):6-22.
- Lightfoot, C. and U. Scheuermeier.** 2006. Linking local learners for improved market linkages. Final report, First Mile Project, Tanzania, April 2006.  
<<http://www.linkinglearners.net/downloads/RepFMfinal.pdf>> 9 November 2009.
- Lightfoot, C. and U. Scheuermeier.** 2007. Organizing the learning for rural marketing through linking local learners: how to improve small holder farmers' links to markets. *Rural Development News* 2:30-34.
- Lightfoot, C., H. Gillman, U. Scheuermeier and V. Nyimbo.** 2008. The first mile project in Tanzania: linking smallholder farmers to markets using modern communication technology. *Mountain Research and Development* 28(1):13-17.
- Lincoln, Y. S. and E. G. Guba.** 1985. *Naturalistic inquiry*. Newbury Park: Sage Publications.
- Lincoln, Y. S. and N. K. Denzin.** 2003. The ethical revolution. In: Lincoln, Y. S. and N. K. Denzin. (eds). *Turning points in qualitative research: tying knots in a handkerchief*. Lanham: Rowman and Littlefield Publishers. pp. 217-238.
- Linderman, A.** 2007. Using Sense-making as dialogic approach to elicit and transfer "deep smarts" for leadership transitions. Presented at non-divisional working symposium on "Making communication studies matter: field relevance/irrelevance to media, library, electronic, communication system designs, policies, practices. San Francisco. 24 May 2007.  
<[http://communication.sbs.ohio-state.edu/sense-making/meet/2007/meet07\\_linderman.pdf](http://communication.sbs.ohio-state.edu/sense-making/meet/2007/meet07_linderman.pdf)> 14 February 2008.
- Lindorff, M.** 2007. The ethical impact of business and organisational research: the forgotten methodological issue? *Electronic Journal of Business Research Methods* 5(1):21-28.



- Little, A., E. Robinson, S. Williamson, R. Lamboll, C. Meir, G. Acola, A. Ali, G. Bagirwa, G. Bockett, M. Kimani, R. Miro, L. O. Oruko, B. Sekamatte, W. Serubombwe and J. Ssemwanga.** 2000. Analysis of farmers' decision-making in pest management. In: Hainsworth, S. D. and S. J. Eden-Green. (eds). *Sustaining change: proceedings of a workshop on the factors affecting uptake and adoption of Department for International Development (DFID) Crop Protection Programme (CPP) research outputs*. Held at Imperial College at Wye, Wye College, Kent, UK, 21-23 June 2000. Kent: Natural Resources International Limited. pp. 81-90.
- Llewellyn, R. S.** 2007. Information quality and effectiveness for more rapid adoption decisions by farmers. *Field Crops Research* 104:148-156.
- Lockheed, M. E., D. T. Jamison and L. J. Lau.** 1980. Farmer education and farm efficiency: a survey. *Economic Development and Cultural Change* 29(1):37-76.
- Loimeier, R.** 2005. The baraza: a grassroots institution. *ISIM Review* 16:26-27.  
<[http://www.isim.nl/files/Review\\_16/Review\\_16-26.pdf](http://www.isim.nl/files/Review_16/Review_16-26.pdf)> 21 April 2008.
- Longbottom, C.** 2009. The perfect device for the developing world is not the PC.  
<<http://www.quocirca.com>> 12 May 2010.
- Low External Input and Sustainable Agriculture (LEISA).** 2007. How farmers organize. *LEISA* 23(1):4-5.
- Lunch, C.** 2004. Participatory video: rural people document their knowledge and innovations. *IK Notes no. 71* August. Washington: The World Bank.
- Lwoga, E. and P. Ngulube.** 2008. Managing indigenous and exogenous knowledge through information and communication technologies for agricultural development and achievement of the UN Millennium Development Goals. In: Njobvu, B. and S. Koopman. (eds). *Libraries and information services towards the attainment of the UN Millennium Goals*. Berlin: Walter de Gruyter. pp. 73-88.
- Lyon, F.** 2000. Trust, networks and norms: the creation of social capital in agricultural economics in Ghana. *World Development* 28(4):663-681.
- Maatman, A. and T. Schrader.** 2009. Enhancing farmers' entrepreneurship: creating conditions for growth. *Kilimo endelevu Africa* 1(1):4-6.
- Machuka, J.** 2001. Agricultural biotechnology for Africa. African scientists and farmers must feed their own people. *Plant Physiology* 126:16-19.
- Madukwe, M. C.** 2006. Delivery of agricultural extension services to farmers in developing countries: issues for consideration.  
<<http://knowledge.cta.int/index.php/en/content/view/full/3009>> 9 April 2007.
- Maier, R.** 2006. *Knowledge management systems: information and communication technologies for knowledge management*. 3rd ed. New York: Springer.
- Maina, F. W.** 2000. *A study of the information landscape in the agricultural sector*. Rural development series on Agricultural Services, Extension and Information. Volume 2. Nairobi: GTZ.
- Mairura, F. S., D. N. Mugendi, J. I. Mwanje, J. J. Ramisch, P. K. Mbugua and J. N. Chianu.** 2008. Scientific evaluation of smallholder land use knowledge in Central Kenya. *Land Degradation and Development* 19:77-90.
- Malekmohammadi, I.** 2009. Interpretive perspective of knowledge management stance in agricultural knowledge information system to fostering research/extension linkage. *American Journal of Agricultural and Biological Sciences* 4(3):230-241.
- Malhotra, Y.** 1998. Compilation of definitions of knowledge management. <[www.brint.com](http://www.brint.com)> 14 June 2007.
- Mamodu, M. O.** 2002. Information needs and seeking behavior of rural dwellers in Nigeria: a case study of Ekpoma in Esan West local government area of Edo State, Nigeria. *Library Review* 51(8):406-410.
- Man, N.** 2009. Factors affecting decision making in off-farm employment among paddy farmers in Kemasin Semerak. *Pertanika Journal of Social Sciences and Humanities* 17(1):7-15.
- Manda, P. A.** 2002. Information and agricultural development in Tanzania: a critique. *Information Development* 18(3):181-189.
- Mangstl, A.** 2008. Emerging issues, priorities and commitments in e-Agriculture. *Agricultural Information Worldwide* 1(1):5-6.

- Manz, C. C. and H. P. Sims Jr.** 1980. Self-Management as a substitute for leadership: a social learning theory perspective. *The Academy of Management Review* 5(3):361-367.
- Maponya, P. E. and P. Ngulube.** 2007. The state of estuarine knowledge of the communities of the Tyolomnqa estuary in the Eastern Cape, South Africa. *South African Journal of Libraries and Information Science* 73(1):75-83.
- March, J. G.** 1994. *A primer on decision making*. New York: The Free Press.
- Mark, A. and D. Snowden,** 2006. Researching practice or practicing research: innovating methods in healthcare – the contribution of Cynefin. In: Casebeer, A. L., A. Harrison and A. Mark. (eds). *Innovations in health care*. Palgrave Macmillan. <[http://www.cognitive-edge.com/ceresources/articles/54\\_Mark & Snowden Article 2006.pdf](http://www.cognitive-edge.com/ceresources/articles/54_Mark_%20Snowden_Article_2006.pdf)> 29 January 2008.
- Marsh, C. P. and A. L. Coleman.** 1956. Group influences and agricultural innovations: some tentative findings and hypotheses. *American Journal of Sociology* 61(6):588-594.
- Marshall, G. R.** 2004. Farmers cooperating in the commons? A study of collective action in salinity management. *Ecological Economics* 51:271-286.
- Marsland, V., I. Wilson, S. Abeyasekera and U. Kleih.** 2000. A methodological framework for combining quantitative and qualitative survey methods. <<http://www.reading.ac.uk/SSC/publications/guides/qqa.pdf>> 10 March 2010.
- Maru, A.** 2004. ICT/ICM in agricultural research and development: status in sub-Saharan Africa. A background paper for FARA-RAILS workshop, Accra, Ghana 27-28 April 2004.
- Maruthi, V. and K. Srinivas.** 2006. Transferring and indigenous practice for soil improvement: cattle manure with groundnut shells. *IK Notes no.* 98 November. Washington: The World Bank.
- Masakure, O. and S. Henson.** 2005. Why do small-scale producers choose to produce under contract? Lessons from nontraditional vegetable exports from Zimbabwe. *World Development* 33(10):1721-1733.
- Masandika, R. and A. Mgangaluma.** 2006. Linking farmers' groups with various agricultural service providers. The MVIWAMO district network of farmers' groups in Tanzania. In: *Bull* 374. pp. 87-92. <[http://www.kit.nl/net/KIT\\_Publicaties\\_output/ShowFile2.aspx?e=914](http://www.kit.nl/net/KIT_Publicaties_output/ShowFile2.aspx?e=914)> 29 December 2009.
- Matovelo, D. S., J. Msuya and E. De Smet.** 2006. Towards developing proactive information acquisition practices among smallholder farmers for empowerment and poverty reduction: a situation analysis. *IAALD Quarterly Bulletin* LI(3/4):256-264.
- Mauch, J. E. and N. Park.** 2003. *Guide to the successful thesis and dissertation: a handbook for students and faculty*. 5th ed. New York: Marcel Dekker Inc.
- Maxwell, S.** 1999. The meaning and measurement of poverty. <<http://www.odi.org.uk/resources/download/2277.pdf>> 3 August 2010.
- May, J., J. Karugia and M. Ndolweni.** 2007. ICT and agricultural development: transformation and employment generation. Final framework paper prepared for the African Economic Research Consortium (AERC). Nairobi: AERC.
- Mayer, R. E.** 2005. *The Cambridge handbook of multimedia learning*. Cambridge: Cambridge University Press.
- McBurney, D. H. and T. L. White.** 2004. *Research methods*. 6th ed. Belmont: Thomson Wadsworth.
- McBurney, D. H. and T. L. White.** 2007. *Research methods*. 7th ed. Belmont: Thomson Wadsworth.
- McCaslin, N. L. and J. P. Tibeziinda.** 1997. Assessing target group needs. In: Swanson, B. E., R. P. Bentz and A. J. Sofranko. (eds). *Improving agricultural extension: a reference manual*. Rome: FAO. <<http://www.fao.org/docrep/W5830E/w5830e00.HTM>> 5 June 2007.
- McClelland, I. G., A. Gartmann and H. Van Rees.** 2004. The power of the farmer group. Proceedings of the 4<sup>th</sup> International Crop Science Congress, 26 September – 1 October 2004, Brisbane, Australia.
- McCorckle, C. A.** 1989. Toward a knowledge of local knowledge and its importance for agriculture RD&E. *Agriculture and Human Values* 6(3):4-12.
- McCracken, G.** 1988. *The long interview*. Qualitative Research Methods Volume 13. London: Sage Publications.

- McCreadie, M. and R. E. Rice.** 1999. Trends in analyzing access to information. Part II: Cross-disciplinary conceptualizations of access. *Information Processing and Management* 35(1):45-76.
- McDermott, R.** 2003. Building spontaneity into strategic communities: eight tips to put excitement into management-created CoPs. *Knowledge Management Review* 5(6):28-31.
- McDowell, G. R.** 2004. The agricultural establishment: giving farmers too much of what they want and not enough of what they need. *Choices* 1st quarter:39-42.
- McElroy, M. W.** 2000. Integrating complexity theory, knowledge management and organizational learning. *Journal of Knowledge Management* 4(3):195-203.
- McElroy, M. W., R. J. Jorna and J. Van Engelen.** 2006. Rethinking social capital theory: a knowledge management perspective. *Journal of Knowledge Management* 10(5):124-136.
- Mchombu, K. J.** 1991. *Information provision for rural development: a final report on phase one of the (INFORAD) Research Project*. Gaborone: University of Botswana, Department of Library and Information Studies; Ottawa: IDRC.
- Mchombu, K. J.** 1992. Information needs for rural development: the case study of Malawi. *African Journal of Library, Archives and Information Science* 2(1):17-32.
- Mchombu, K. J.** 1993. *Information needs and seeking patterns for rural peoples' development in Africa: a research report*. Gaborone: University of Botswana, Department of Library and Information Studies.
- Mchombu, K. J.** 1999. Designing women oriented information resource centres in Africa. *Information Development* 15(4):212-216.
- Mchombu, K. J.** 2001. Research on measuring the impact of information on rural development. In: Stilwell, C., A. Leach and S. Burton. *Knowledge, information and development: an African perspective*. Pietermaritzburg: University of Natal, School of Human and Social Studies. pp. 229-238.
- Mchombu, K. J.** 2003. Information dissemination for development: an impact study. *Information Development* 19(2):111-125.
- Mchombu, K. J.** 2004. *Sharing knowledge for community development and transformation: a handbook*. <[http://www.oxfam.ca/publications/sharing\\_knowledge.htm](http://www.oxfam.ca/publications/sharing_knowledge.htm)> 15 November 2009.
- Mchombu, K. J.** 2005. What makes information a strategic economic resource: the role of librarians and other information professionals in Africa. Paper presented at the Fourth Meeting of the Committee on Development Information (CODI IV), 23-28 April 2005, Addis Ababa, Ethiopia.
- Mchombu, K. J.** 2007. Harnessing knowledge management for Africa's transition to the 21st Century. *Information Development* 23(1):25-42.
- Mchombu, K. J. and N. Cadbury.** 2006. Libraries, literacy and poverty reduction: a key to African development. A research paper looking at libraries in Africa commissioned by Book Aid International and sponsored by the Commonwealth Foundation. <[http://www.bookaid.org/resources/downloads/Libraries\\_Literacy\\_Poverty\\_Reduction.pdf](http://www.bookaid.org/resources/downloads/Libraries_Literacy_Poverty_Reduction.pdf)> 3 April 2008.
- Mchombu, K. J., R. Genesse, E. Tadesse and M. H. Mariam.** 2001. Information and development symposium. A symposium on Information and Development held in Addis Ababa in May 2001. *Information Development* 17(3):184-188.
- McKelvey, B.** 1999a. Complexity theory in organization science: seizing the promise or becoming a fad? *Journal of Complexity* 1(1):5-32.
- McKelvey, B.** 1999b. Avoiding complexity catastrophe in coevolutionary pockets: strategies for rugged landscapes. *Organization Science* 10(3):294-321.
- McKenzie, P. J.** 2003. A model of information practices in accounts of everyday-life information seeking. *Journal of Documentation* 59(1):19-40.
- McNiff, U. and J. Whitehead.** 2006. *All you need to know about action research*. London: Sage Publications.
- Meert, H., G. Van Huylenbroeck, T. Vernimmen, M. Bourgeois, E. Van Hecke.** 2005. Farm household survival strategies and diversification on marginal farm. *Journal of Rural Studies* 21:81-97.



- Mehra, B., A. P. Bishop and I. Bazzell.** 2000. The role of use scenarios in developing a community health information system. *Bulletin of the American Society of Information Science* 26(4). <[http://www.asis.org/Bulletin/May-00/mehra\\_et\\_al.html](http://www.asis.org/Bulletin/May-00/mehra_et_al.html)> 22 February 2008.
- Mehra, B., C. Merkel and A. P. Bishop.** 2004. The internet for empowerment of minority and marginalized users. *New Media and Society* 6(6):781-802.
- Menou, M. J. and K. Mchombu.** 2007. Information professionals serving disadvantaged communities. *Journal of Information, Communication and Ethics in Society* 5(2/3):140-154. (abstract)
- Menter, H., S. K. Kaaria, N. L. Johnson and J. A. Ashby.** 2004. Scaling up. In: Pachico, D. H. and S. Fujisaka. (eds). *Scaling up and out: achieving widespread impact through agricultural research*. CIAT Publication no. 340. Economics and Impact Series 3. Cali: CIAT. pp. 9-23.
- Meredith, M.** 2006. *The state of Africa: a history of fifty years of independence*. London: Free Press.
- Merriam Webster Online dictionary.** 2010. Springfield: Merriam-Webster <<http://www.merriam-webster.com/dictionary/framework>> 8 January 2010.
- Meyer, H. W. J.** 2000. The transfer of agricultural information to rural communities. D. Phil diss. Pretoria: University of Pretoria.
- Meyer, H. W. J.** 2002. Information as a resource for rural development. *Mousaion* 20(1):93-108.
- Meyer, H. W. J.** 2003a. Information use in rural development. *The New Review of Information Behaviour Research* 2003:109-126.
- Meyer, H. W. J.** 2003b. Communication mechanisms of indigenous knowledge systems: gateway to untapped resources. *Mousaion* 21(1):27-52.
- Meyer, H. W. J.** 2005. The nature of information, and the effective use of information in rural development. *Information Research* 10(2) <<http://informationr.net/ir/10-2/paper214.html>> 19 April 2007.
- Meyer, H. W. J.** 2009. The influence of information behaviour on information sharing across cultural boundaries in development contexts. *Information Research* 14(1). <<http://informationr.net/ir/14-1/paper393.html>> 27 January 2010.
- Meyer, H. W. J. and J. A. Boon.** 2003. Provision of agricultural information for development: a case study on crossing communication boundaries. *Libri* 53:174-184.
- Mgumia, A. H.** 2001. Tanzania: communicating local farming knowledge. *IK Notes* no. 34 July. Washington: The World Bank.
- Micheni, A. N. and S. K. Gathama.** 1999. Farmers' participation in determining the adoption of maize varieties in Central and Eastern Highlands of Kenya. In: Sutherland, J. A. (ed.) *Towards increased use of demand driven technology*. Pre-conference mini-papers prepared for the KARI/DFID NARP II Project. End of Project Conference, 23-26 March 1999, Nairobi, Kenya. pp. 27-31.
- Middleton, M.** 2007. Using traditional knowledge in economic development: the impact of raised field irrigation on agricultural production in Puno, Peru. *IK Notes* no. 99 January. Washington: The World Bank.
- Mihale, M. J., A. L. Deng, H. O. Selemani, M. Mugisha-Kamatenesi, A. W. Kidukuli and J. O. Ogendo.** 2009. Use of indigenous knowledge in the management of field and storage pests around Lake Victoria basin in Tanzania. *African Journal of Environmental Science and Technology* 3(9):251-259.
- Miles, M. B. and A. M. Huberman.** 1994. *An expanded sourcebook: qualitative data analysis*. 2nd ed. Thousand Oaks: Sage Publications.
- Millar, D.** 2004. Interfacing two knowledge systems: local knowledge and science in Africa. Paper presented at the Compas panel in the conference: Bridging Scales and Epistemologies: Linking Local Knowledge with Global Science in Multi-Scale Assessments, March 2004. Alexandria.
- Millennium Development Goals (MDGs). Technical Support Centre.** 2004. *Africa's green revolution: a call to action. Innovative approaches to meet the Hunger Millennium Development Goal in Africa*. Proceedings of the July 5th, 2004 high-level Seminar, Addis Ababa, Ethiopia, convened by the Government of Ethiopia and the United Nations Millennium Project.
- Minot, N. and M. Ngigi.** 2004. Are horticultural exports a replicable success story? Evidence from Kenya and Côte d'Ivoire. EPTD Discussion Paper no. 120. Washington: IFPRI.

- Minten, B., L. Randrianarison and J. F. M. Swinnen.** 2009. Global retail chains and poor farmers: evidence from Madagascar. *World Development* 37(11):1728-1741.
- Mirikhoozani, S. A.** 1993. Factors affecting the availability and relevance of technology for wheat producers in Iran: a study of the agricultural knowledge and information system (AKIS). PhD. diss. Wageningen: Wageningen Agricultural University. (abstract).
- Mishev, P. and P. Kostove.** 2004. Decision making pattern of subsistence farmers in Bulgaria. <<http://129.3.20.41/eps/othr/papers/0409/0409012.pdf>> 16 January 2010.
- Mishra, S. and B. E. Swanson.** 2009. Extension's role in organising producer groups: a case study of Orissa, India. Proceedings of the AIAEE annual meeting, Intercontinental, San Juan Resort, Puerto Rico. pp. 331-342.
- Miwa, M.** 2005. Bandura's social cognition. In: Fisher, K. E., S. Erdelez and L. E. F. McKechnie. (eds). *Theories of information behavior*. (ASIST Monograph). Medford, NJ: Information Today. pp. 54-57.
- Modi, A. T.** 2003. What do subsistence farmers know about indigenous crops and organic farming? Preliminary experience in KwaZulu-Natal. *Development Southern Africa* 20(5):675-684.
- Mondé, P.** 2008. Traditional knowledge: hidden treasures. *Spore* 134:16.
- Moock, P. R.** 1976. The efficiency of women as farm manager: Kenya. *American Journal of Agricultural Economics* 58(5):831-835.
- Mook, B., H. Munyua and P. Nampala.** 2005. Baseline study of agricultural information in the Eastern and Central Africa region. Regional Agricultural Information Network (RAIN) baseline study. Entebbe: ASARECA.
- Morgan, K. L.** 1993. Research findings on rural radio listenership in Meru and Tharaka Nithi districts (Kenya). Nairobi: Agricultural Information Centre.
- Morris, C. D.** 2001. Getting the write message right: a review of guidelines for producing and evaluating print agricultural information materials. <[http://www.gssa.co.za/sacrb/Repackaging\\_Document.pdf](http://www.gssa.co.za/sacrb/Repackaging_Document.pdf)> 18 July 2007.
- Morris, C. D.** 2007. Assessment of agricultural information needs in African, Caribbena and Pacific (ACP) states. Southern Africa. Country study: South Africa final report. Report prepared on behalf of the Technical Centre for Agricultural and Rural Cooperation (CTA). Project: 4-7-41-209-6/d. <[http://fr.fara-africa.org/library/browse/Final\\_South\\_Africa-report\\_10\\_12\\_07\\_.pdf](http://fr.fara-africa.org/library/browse/Final_South_Africa-report_10_12_07_.pdf)> 6 November 2009.
- Morris, C. D. and C. Stilwell.** 2003. Getting the write message right: review of guidelines for producing readable print agricultural information materials. *South African Journal of Library and Information Science* 69(1):71-83.
- Moser, C. and G. Kalton.** 2004. Questionnaire. In: Seale, C. (ed.) *Social research methods: a reader*. London: Routledge. pp. 73-87.
- Mosia, L. N. and P. Ngulube.** 2005. Knowledge sharing and distribution for the sustainable utilisation of estuaries in the Eastern Cape. Paper presented at the International conference on collaboration and sharing of knowledge (KMSSA).
- Mosse, D.** 1994. Authority, gender and knowledge: theoretical reflections on the practice of participatory rural appraisal. *Development and Change* 25:497-526.
- Mostert, J. and D. Ocholla.** 2004. Informaton needs and information-seeking behaviour of parliamentarians in South Africa. In: Bothma, T. J. D. and A. Kaniki. (eds). Proceedings of the 3<sup>rd</sup> biennial DISSAnet Concerence. Pretoria, 28-29 October 2004. Pretoria: Infuse. pp. 41-65.
- Moussa, I. M.** 2006. Impact of privatization of advisory services on agricultural knowledge and information systems: evidence form 'LEC' knowledge management in Banikoara, Benin *IAALD Quarterly Bulletin* LI(3/4):208-214.
- Mouton, J. and H. C. Marais.** 1996. *Basic concepts in the methodology of social sciences*. Pretoria: Human Sciences Research Council.
- Mubangizi, N., N. M. Mangheni and C. J. Garforth.** 2004. Information sources and constraints under national agricultural advisory services programme, of service providers in Uganda. *Uganda Journal of Agricultural Sciences* 9:257-264.

- Mugenda, O. M. and A. G. Mugenda.** 2003. *Research methods: qualitative and quantitative approaches*. Nairobi: African Centre for Technology Studies.
- Mukhebi, A.** 2004. Reaching the poor in rural Kenya with market information: a case study of a market information system. Paper presented at the CTA Seminar 2004 on the Role of Information Tools in Food Security, Maputo, Mozambique, November 8-12, 2004.
- Mukhebi, A. W., J. Kundu, A. Okolla, M. Wambua, W. Ochieng and G. F. Wamba.** 2007. Linking farmers to markets through modern information and communication technologies in Kenya. In: Nambiro, E., M. N. Omare and G. B. Nkamleu. (eds). AAAE Second International Conference Proceedings. Accra: AAA. pp. 23-27.  
<<http://ageconsearch.umn.edu/bitstream/51988/2/Mukhebi.pdf>> 12 January 2010.
- Mukhebi, A., S. Mbogoh and K. Matungulu.** 2010. An overview of the food security situation in Eastern Africa. Addis Ababa: ECA.  
<[http://www.uneca.org/eca\\_programmes/srdc/ea/meetings/srcm2010/Food%20Security%20OVERVIEW.pdf](http://www.uneca.org/eca_programmes/srdc/ea/meetings/srcm2010/Food%20Security%20OVERVIEW.pdf)> 23 March 2010.
- Mukhwana, E. J., M. Nyongesa and V. Ogemah.** 2005. *Facilitating small scale farmer collective marketing activities in Africa: the case of cereals banks in Kenya*. Nairobi: Sustainable Agriculture Centre for Research, Extension and Development in Africa (SACRED Africa).
- Muktasam, A. and S. Chamala.** 2001. A group action learning model for sustainable rural community development: reflections on an Indonesian case. In: Falk, I. (ed.) *Learning to manage change: developing regional communities for a local global millennium*. Adelaide: NCVER. pp. 117-124. <<http://www.ncver.edu.au/publications/682.html>> 26 March 2008.
- Mulaa, M. A., D. J. Rees, C. Chesoli, M. Powon and J. Wanyama.** 1999. Farmer participation in research design, implementation and evaluation of tomato varieties in Trans-Nzoia district, Nyakinyua village case study. In: Sutherland, J. A. (ed.) *Towards increased use of demand driven technology*. Pre-conference mini-papers prepared for the KARI/DFID NARP II Project. End of Project Conference, 23-26 March 1999, Nairobi, Kenya. pp. 25-27.
- Mulira, G. L., V. Mason, B. Mukasa, M. Wanyonyi, D. Wekesa, P. Kisiang'ani.** 1999. Factors influencing the use of local livestock health knowledge in settlement areas in North Rift Valley. In: Sutherland, J.A. (ed.) 1999. *Towards increased use of demand driven technology*. Pre-conference mini-papers prepared for the KARI/DFID NARP II Project. End of Project Conference, 23-26 March 1999, Nairobi Kenya. pp. 485-489.
- Mundy, P. and J. L. Compton.** 1991. Indigenous communication and indigenous knowledge. *Development Communication Report* 74(3).  
<[http://www.mamud.com/Docs/ic\\_and\\_ik\\_dcr.pdf](http://www.mamud.com/Docs/ic_and_ik_dcr.pdf)> 26 January 2010.
- Mundy, P. and J. L. Compton.** 1995. Indigenous communication and indigenous knowledge. In: Warren, D.M., L.J. Sikkerveer and D. Brokensha. (eds). *The cultural dimension of development: indigenous knowledge systems*. London: Intermediate Technology Publications. pp. 112-123.
- Mundy, P. and J. Sultan.** 2001. *Information revolutions: how information and communication management is changing the lives of rural people*. Wageningen: Technical Centre for Agricultural and Rural Cooperation.
- Munyua, H.** 2000. Information and communication technologies (ICTs) for rural development and food security: lessons from field experiences in developing countries. A paper presented at the workshop: The Role of Information and Communication Technologies in Rural Development and Food Security, 5-6 June 2000, Rome, Italy. <<http://www.fao.org/coaim/ictws>>  
<<http://fao.org/coaim/ictus/munyua.htm>> 5 June 2007.
- Munyua, H.** 2003. Sustainability of pilot multipurpose community telecentres in Kenya and Uganda. MBA thesis. Nairobi: University of Nairobi.
- Munyua, H.** 2006. Kenya AGRIS Pilot Project: needs assessment. A consultancy report. Nairobi: KARI.
- Munyua, H.** 2007. ICTs and small-scale agriculture in Africa. A scoping study. Nairobi: IDRC.  
<[http://www.idrc.ca/uploads/user-S/12212542261Final\\_Report\\_HMunyua.pdf](http://www.idrc.ca/uploads/user-S/12212542261Final_Report_HMunyua.pdf)> 3 May 2009.
- Munyua, H. and C. Stilwell.** 2010. A mixed qualitative-quantitative-participatory methodology: a study of the agricultural knowledge and information system (AKIS) of small-scale farmers in Kirinyaga district, Kenya. *Library Management* 31(1/2):5-18.



- Munyua, H., D. Baguma, B. Mook, J. Nyagahima and D. Mukhebi.** 2003. Regional Agricultural Information Network (RAIN) Priority Setting Report. Entebbe: ASARECA.
- Munyua, H., E. Adera and M. Jensen.** 2009. Emerging ICTs and their potential in revitalizing small-scale agriculture in Africa. *Agricultural Information Worldwide* 2(1):3-9.
- Munyua, H. and J. Adupa.** 2002. Improving rural livelihoods through community telecentres: the case of Uganda. Paper presented at Ethio-Forum 2002. Addis Ababa, Ethiopia, 15 January – 4 February 2002.
- Munyua, H. and M. Mureithi.** 2003. Open Knowledge Network – East African pilot evaluation: AfriAfya hub report. A consultancy report.
- Munyua, H. and M. Mureithi.** 2004. The Arid Lands Information Network – Eastern Africa (ALIN-EA). Programme evaluation and M&E report. Nairobi: ALIN-EA.
- Mureithi, J. G., C. K. K. Gachene, F. N. Munyekho, M. Onyango, L. Mose and O. Magenya.** (eds). 2000. *Participatory technology development for soil management by small holders in Kenya. Proceedings of the 2nd Scientific conference of the Soil Management and Legume Research Network projects.* Nairobi: KARI.
- Muriuki, H., A. Omere, N. Hooton, M. Waithaka, R. Ouma, S. J. Staal and P. Odhiambo.** 2003. The policy environment in the Kenya dairy sub-sector: a review. Smallholder Dairy Project Research and Development Report 2. Nairobi: ILRI.
- Musi, D., T. Stilwell, J. Nhlapo-Hlope and M. N. Makhura.** 2004. Interacting with rural stakeholders: rural development week. *South Africa Rural Development Quarterly* 2 Q. 4 October-December 2004.
- Muto, M. and Y. Takashi.** 2009. The impact of mobile phone coverage expansion on market participation: panel data evidence from Uganda. *World Development* 37(12):1887-1896.
- Mutua-Kombo, E.** 2001. Women's groups and information provision in rural Kenya. *Library Review* 50(4):193-196.
- Muyanga, M. and T. S. Jayne.** 2006. Agricultural extension in Kenya: practice and policy lessons. Working Paper no. 26. Nairobi: Tegemeo Institute of Agricultural Policy and Development.
- Muyanga, M. and T. S. Jayne.** 2008. Private agricultural extension system in Kenya: practice and policy lessons. *The Journal of Agricultural Education Extension* 14(2):111-124.
- Muyinza, H. and A. Agona.** 2006. Using participatory communication to transfer agricultural technologies: experience of farmer groups in pigeonpea project, Apac district, Uganda. *IAALD Quarterly Bulletin* LI(3/4):234-238.
- Myers, M. D.** 1997. Qualitative research in information systems. *MIS Quarterly* 21(2):241-242.
- Nagayets, O.** 2005. Small farms: current status and key trends. Paper prepared for the future of small farms. Research Workshop, Wye College, June 26-29 2005.  
<[http://www.ifpri.org/events/seminars/2005/smallfarms/sfproc/Appendix InformationBrief.pdf](http://www.ifpri.org/events/seminars/2005/smallfarms/sfproc/Appendix%20InformationBrief.pdf)> Accessed 14 December 2007.
- Naimi, L.** 2007. Strategies for teaching research ethics in business, management and organisational studies. *The Electronic Journal of Business Research Methods* 5(1):29-36.
- Nakamori, Y.** 2006. Designing, utilizing and evaluating 'technology-creating ba' in a Japanese scientific research institution. *Systems Research and Behavioral Science* 23:3-19.
- Nakashima, D. and M. Roué.** 2002. Indigenous knowledge, peoples and sustainable practice. In: Immerman, P. (ed.) *Encyclopaedia of global environmental change*. Volume 5. Social and economic dimensions of global environmental change. Chichester: John Wiley and Sons Ltd. pp. 314-324.
- Nan, N.** 2008. A principal-agent model for incentive design in knowledge sharing. *Journal of Knowledge Management* 12(3):101-113.
- Narayan, D.** 1996. *Toward participatory research*. World Bank Technical Paper No. 97. Washington: World Bank.
- Narayan, S. and A. Gulati.** 2002. Globalization and smallholders: a review of issues, approaches and implications. *IFPRI MSSD Discussion Paper* 50. Washington: IFPRI.
- Nathan, I., S. Lund and I. Theilade.** 2007. People, trees and agriculture in Africa: constraints and options for improved management of trees in Tanzania and Burkina Faso. TES special issue on the importance of local knowledge and interdisciplinary research. *Journal of Transdisciplinary Environmental Studies* 6(1). <<http://www.journal-tes.dk/>> 9 June 2008.

- Nathaniels, N., R. I. Lamboll, M. A. C. Conroy and A. Youdeowei. 2008. Agricultural information management. SCARDA Briefing Paper.
- National Agricultural Advisory Services Programme (NAADS). 2006. District and sub-county general performance assessment. Kampala: NAADS.
- National Economic and Social Council of Kenya (NESC). 2007. The Kenya Vision 2030 Programme. <[www.nesc.go.ke](http://www.nesc.go.ke)> 19 June 2007.
- Numer, C. M., K. E. Fisher and B. Dervin. 2008. Sense-Making: a methodological perspective. <<http://dmrussell.googlepages.com/Numer-final.pdf>> 11 February 2010.
- Ndiaye, D. 1995. Research and evaluation on the experience of transferring scientific and technical information to herdsmen in Senegal. In: IFLA-ALP *Seminar on information provision to rural communities in Africa*. Proceedings of the seminar held in Gaborone, Botswana, 22-25 June 1994. Uppsala: Uppsala University Library. IFLA-ALP Report no. 3. pp. 115-123.
- Ndubi, J. 1998. Importance of gender considerations in agricultural research. In: Curry, J., M. Kooijman and H. Recke. (eds). *Institutionalising gender in agricultural research: experiences from Kenya*. Proceedings of the Gender Conference, KARI Headquarters, Nairobi, Kenya 5-7 October 1998. Nairobi: KARI. pp. 111-124.
- Ndungu, F. W., C. Nkonge and D. J. Reeves. 2000. Agricultural knowledge and information systems (AKIS) paradigm: its potential in disseminating soil management technologies. In: Mureithi, J. G., C. K. K. Gachene, F. N. Munyeko, M. Onyango, L. Mose and O. Maganya. (eds). *Participatory technology development for soil management by small holders in Kenya*. Proceedings of the 2nd Scientific conference of the Soil Management and Legume Research Network projects. Nairobi: KARI. pp. 521-527.
- Nederlof, E. S. and C. Dangbégnon. 2007. Lessons for farmer-oriented research: experiences from a West African soil fertility management project. *Agriculture and Human Values* 24:369-387.
- Neubert, S., V. Hesse, S. Iltgen, J. O. Onyado, W. Onchoke, V. Peter, A. Aeelaff and D. Taras. 2007. Poverty oriented irrigation policy in Kenya: empirical results and suggestions for reform. German Development Institute Discussion Paper 12/2007. Bonn: German Development Institute.
- Neuman, W. L. 2006. *Social research methods: qualitative and quantitative approaches*. 6th ed. Boston: Pearson.
- Ngimwa, P., D. N. Ocholla and J. Ojiambo. 1997. Media accessibility and utilization by Kenyan rural women. *International Information and Library Review* 29:45-66.
- Ngowi, A. V. F., T. J. Mbise, A. S. M. Ijani, L. London and O. C. Ajayi. 2007. Smallholder vegetable farmers in Northern Tanzania: pesticides use practices, perceptions, cost and health effects. *Crop Protection* 26(11):1617-1624.
- Ngulube, P. 2002. Managing and preserving indigenous knowledge in the knowledge management era: challenges and opportunities. *Information Development* 18(2):95-100.
- Ngulube, P. 2005. Research procedures used by master of information studies students at the University of Natal in the period 1982-2002 with special reference to their sampling techniques and survey response rates: a methodological discourse. *The International Information and Library Review*. 37:127-143.
- Ngulube, P. and E. Lwoga. 2009. Managing agricultural indigenous and exogenous knowledge through information and communication technologies for poverty reduction in Tanzania. *Indilinga African Journal of Indigenous Knowledge Systems* 8(1):95-113.
- Ngulube, P., K. Mokwatlo and S. Ndwandwe. 2009. Utilisation and prevalence of mixed methods research in library and information research in South Africa 2002-2008. *South African Journal of Libraries and Information Science* 75(2):105-116.
- Niang, T. 1995. The promotion of the dissemination of agricultural information in Africa: CTA's role. In: Aina, L. O., A. M. Kaniki and J. B. Ojiambo. (eds). 1995. *Agricultural information in Africa*. Ibadan: Third World Information Services Ltd. pp. 190-196.
- Nielsen, L. C., Heffernan, Y. Lin and J. Yu. 2010. The Daktari: an interactive, multi-media tool for knowledge transfer among poor livestock keepers in Kenya. *Computers and Education* 54:1242-1247.
- Nieuwenhuis, L. F. M. 2002. Innovation and learning in agriculture. *Journal of European Industrial Training* 26(6):283-291.



- Nilan, M. S. and B. Dervin.** 1999. Beyond agency to structure: moving quantitative Sense-Making to a focus on both societal structural arrangements and information seeking agency. *The Electronic Journal of Communication* 9(2/3/4).
- Nilsen, E. R.** 2006. Organizing for the sharing and creation of knowledge – are we too afraid to kill it? Paper submitted to OLKC 2006 Conference at the University of Warwick, Coventry. 20-22 Mar 2006.
- Njeru, J., L. Gitonga and V. Machira.** 2008. Assessment of agricultural information needs in African, Caribbean and Pacific (ACP) States. Eastern Africa. Country study: Kenya. Report prepared on behalf of the Technical Centre for Agricultural and Rural Cooperation (CTA). Project: 4-7-41-255-7/e.  
<[http://www.anancy.net/documents/file\\_en/081126\\_Kenya\\_Final\\_report.pdf](http://www.anancy.net/documents/file_en/081126_Kenya_Final_report.pdf)> 12 April 2010.
- Njiraini, D., D. Ocholla and J. Le Roux.** 2008. Auditing the indigenous knowledge systems in Kenya (IKS): challenges and opportunities. Paper presented at the Moi University 3<sup>rd</sup> Annual International Conference, Eldoret, Moi University, 31 July to 4 August 2007.
- Njuguna, J. G. M., G. I. Oduor and D. N. Njenga.** 1999. Rate of adoption of new late blight resistant potato cultivars by farmers in Kiambu district. In: Sutherland, J. A. (ed.) *Towards increased use of demand driven technology*. Pre-conference mini-papers prepared for the KARI/DFID NARP II Project. End of Project Conference, 23-26 March 1999, Nairobi Kenya. pp. 68-72.
- Noffke, S. E.** 2002. Action research: towards the next generation. In Day, C., J. Elliot, B. Somekh and R. Winter. (eds). *Theory and practice in action research: some international perspectives*. Wallingford: Symposium Books. pp. 13-26.
- Nonaka, I.** 1998. The knowledge-creating company. In: *Harvard Business Review on Knowledge Management*. Harvard: Harvard Business School Press. pp. 21-45.
- Nonaka, I. and H. Takeuchi.** 1995. The knowledge creating company: how Japanese companies create the dynamics of innovation. New York: Oxford University Press.
- Nonaka, I. and N. Konno.** 1998. The concept of “Ba”: building a foundation for knowledge creation. *California Management Review* (40:3):40-54.
- Nonaka, I. and R. Toyama.** 2005. The theory of the knowledge-creating firm: subjectivity, objectivity and synthesis. *Industrial and Corporate Change* 14(3):419-436.
- Nonaka, I., R. Toyama, and N. Konno.** 2000. SECI, Ba, and leadership: a unified model of dynamic knowledge creation. *Long Range Planning* 33:5-34.
- Noordin, Q., A. Niang, B. Jama and M. Nyasimi.** 2001. Scaling up adoption and impact of agroforestry technologies: experiences from Western Kenya. *Development in Practice* 11(4):509-523.
- Nwokeabia, H.** 2006. Linking agricultural innovations to knowledge sharing in Africa. *IK Notes* no. 88 January. Washington: The World Bank.
- Nyambo, B., A. Sief, A. M. Varela, B. Löhr, J. Cooper and H. Dobson.** 2009. Private extension-service provision for smallholder horticultural producers in Kenya: an approach. *Development in Practice* 19(1):94-102.
- Nyambo, B. and R. Nyagah.** 2006. Sustaining Kenyan smallholders in fresh produce markets. *Pesticides News* 71:10-11.
- Nyankanga, R. O., H. C. Wien, O. M. Olanya and P. S. Ojiambo.** 2004. Farmers’ cultural practices and management of potato late blight in Kenya highlands: implications for development of integrated disease management. *International Journal of Pest Management* 50(2):135-144.
- Nyoro, J. K., J. Ariga and I. K. Ngugi.** 2007. Kenya case study. In: Vorley, B., A. Fearne and D. Ray. (eds). *Regoverning markets: a place for small-scale producers in modern agrifood chains?* Hampshire: Gower Publishing Company. pp. 163-171.
- Nyumba, J. B.** 2006. The role of the library in promoting the application of indigenous knowledge (IK) in development projects. Paper presented at the World Library and Information Congress: 72<sup>nd</sup> IFLA General Conference and Council, 20-24 August 2006, Seoul, Korea.  
<<http://www.ifla.org/IV/ifla72/index.htm>> 23 August 2007.

- Obara, D.** 1988. Small-scale agriculture systems and food production in Kenya. In: Hirst, J., J. J. Overton, B. Allen and Y. Byron. (eds). *Small-scale agriculture*. Canberra: Australia Commonwealth Geographic Bureau. pp. 143-152.
- Ochieng, A. O.** 1997. Opening address: Review of agricultural practices and constraints in south west Kenya, Kisii, 3-5 October 1995. In: Rees, D. J., E. K. Njue, F. W. Makini and D. M. Mbugua. 1997. *A review of agricultural practices and constraints in south west Kenya*. Kitale: Kenya Agricultural Research Institute. pp. 1-2.
- Ochieng, D. O. and T. M. Waema.** 2009. Innovative design approach for user interfaces for rural farming communities: the Kenyan experience. CHI 2009, April 4-9 2009. Boston, Massachussets. <[http://www.ics.uci.edu/~nsambasi/hcc4id/Final\\_Orwa.pdf](http://www.ics.uci.edu/~nsambasi/hcc4id/Final_Orwa.pdf)> 2 March 2010.
- Ocholla, D. N.** 2006. Information accessibility by the marginalized communities in South Africa and the role of libraries. In: The IFLA/FAIFE theme report 2006: libraries and the fight against HIV/AIDS, poverty and corruption. Held in Seoul, Korea on the 22 August 2006. pp.15-27. <<http://www.ifla.org/faife/report/WorldReportpr-2006.htm>> 4 April 2008.
- Ocholla, D. N.** 2007. Marginalized knowledge: an agenda for indigenous knowledge development and integration with other forms of knowledge. *International Review of Information Ethics* 7(09):236-245. <[http://www.i-r-i-e.net/inhalt/007/irie\\_007\\_full.pdf](http://www.i-r-i-e.net/inhalt/007/irie_007_full.pdf)> 26 January 2010.
- Odini, C.** 1995. Stimulating the use of information in Kenya. *New Library World* 96(2):23-25.
- Oettie, N. and B. Koelle.** 2003. Capitalising on local knowledge: community knowledge exchange. A toolkit for the preparation, implementation and evaluation of community-to-community knowledge and learning exchanges. Toolkit 1. Methodological overview & case studies. Washington: The World Bank, Africa Region, Indigenous Knowledge for Development Programme.
- Ofuoku, A. U., G. N. Emah and B. E. Itedjere.** 2008. Information utilization among rural fish farmers in Central agricultural zone of Delta state, Nigeria. *World Journal of Agricultural Sciences* 4(5):558-564.
- Oggema, M. W.** 1997. Opening address: review of agricultural practices and constraints in the north of Rift Valley, National Agricultural Research Centre, Kitale. In: Rees, D. J., C. Nkonge and J. L. Wandera. (eds). *A review of agricultural practices and constraints in the north of Rift Valley Province, Kenya*. Kitale: Kenya Agricultural Research Institute. pp. 1-3.
- O'Hara, K., H. Alani and N. Shadbolt.** 2002. Identifying communities of practice: analysing ontologies as networks to support community recognition. <<http://eprints.ecs.soton.ac.uk/6522/1/OHara-IFIP-WCC-2002-camera-ready.pdf>> 10 February 2008.
- Ojiambo, J. B.** 1995. Agricultural information systems in Kenya. In: Aina, L. O., A. M. Kaniki and J. B. Ojiambo. (eds). *Agricultural information in Africa*. Ibadan: Third World Information Services Ltd. pp. 108-127.
- Okello, J. J., R. M. Okello and E. Ofwona-Adera.** 2010. Awareness and use of mobile phones for market linkage by smallholder farmers in Kenya. In: E-agriculture and e-government for global policy development: implications and future directions. Maumbe, B. M. (ed.) Hershey: IGI Global. pp. 1-18.
- Okorie, V. O., D. O. Torimiro, T. F. Ojo and O. K. Kazim.** 2009. Youth's involvement in car wash activities: a potential pull of agricultural labour in Osun State, Nigeria. *The African Symposium: African Educational Research Network* 9(1):83-93.
- Okwu, O. J., A. A. Kuku and J. I. Abaz.** 2007. An assessment of use of radio in agricultural information dissemination: a case study of radio Benue in Nigeria. *African Journal of Agricultural Research* 2:1:014-018.
- Oladokun, S. O.** 1994. An empirical study of information needs of women in agriculture (WIA) in Oyo State, Nigeria. *IAALD Quarterly Bulletin* 39(4):319-323.
- Olsson, M.** 2003. The construction of the meaning and significance of an 'author' among information behaviour researchers: a social constructivist approach. PhD. diss. Sydney: University of Technology Sydney.

- Olsson, M.** 2005a. Meaning and authority: the social construction of an 'author' among information behaviour researchers. *Information Research* 10(2). Paper 219. <<http://InformationR.net/ir/10-2/paper219.html>> 10 December 2007.
- Olsson, M.** 2005b. Sense-making Sense-Making methodology: information researchers construct Dervin and her work. Paper presented at a non-divisional workshop held at the meeting of the International Communication Association, New York City. May 2005. <[http://communication.sbs.ohio-state.edu/sense-making/meet/2005/meet05olsson\\_ex.pdf](http://communication.sbs.ohio-state.edu/sense-making/meet/2005/meet05olsson_ex.pdf)> 20 December 2007.
- Olsson, M.** 2005c. Beyond 'needy' individuals: conceptualizing information behavior. In: Grove, and Andrews. (eds). *Proceedings 68th Annual Meeting of the American Society for Information Science and Technology* 42. <<http://onlinelibrary.wiley.com/doi/10.1002/meet.1450420161/pdf>> 5 February 2011.
- Omwoha, J. N.** 2007. Gender contribution and constraints to rural agriculture and household food security in Kenya: case of Western Province. In: Nambiro, E, M. N. Omare and G. B. Nkamleu. (eds). *AAAE Second International Conference Proceedings*. Accra: AAA pp. 369-372. <<http://ageconsearch.umn.edu/bitstream/52148/2/Omwoha.pdf>> 12 January 2010.
- Onderstesteejan, C. J. M., G. W. J. Giesen and R. B. M. Huirne.** 2003. Identification of farmer characteristics and farm strategies explaining changes in environmental management and environmental and economic performance of dairy farms. *Agricultural Systems* 78:31-55.
- Onduru, D. D., F. M. Muchena, L. Gachimbi and F. Maina.** 2002. Experiences with farmer field schools in Kenya: literature review of IPM, IPPM and INM. Integrated Nutrient Management to Attain Sustainable Productivity Increases in East African Farming Systems (INMASP) Report no. 01. Nairobi: ETC East Africa and KARI.
- Onwuegbuzie, A. J. and C. Teddlie.** 2003. A framework for analyzing data in mixed methods research. In: Tashakkori, A. and C. Teddlie. (eds). *Handbook of mixed methods in social and behavioral research*. Thousand Oaks: Sage Publications. pp. 351-383.
- Onyx, J. and P. Bullen.** 2001. The different faces of social capital in NSW Australia. In: Dekker, P. and E. M. Uslaner. (eds). *Social capital and participation in everyday life*. London: Routledge. pp. 45-58.
- Opiyo, D.** 2010. Kenya: banking via phone made possible. *Daily Nation*, Tuesday May 18. <<http://allafrica.com/stories/201005190064.html>> 21 May 2010.
- Opondo, C., L. German, A. Stroud and O. Engorok.** 2006. Lessons from using participatory action research to enhance farmer-led research and extension in Southwestern Uganda. African Highlands Initiative Working Paper No. 3. <[http://www.africanhighlands.org/pdfs/wps/ahiwip\\_03.pdf](http://www.africanhighlands.org/pdfs/wps/ahiwip_03.pdf)> 10 June 2007.
- Organisation for Economic Co-operation and Development (OECD).** 2010. Glossary of statistical terms – gross value added. <<http://stats.oecd.org/glossary/detail.asp?ID=1184>> 21 May 2010.
- Owens, F. N.** 1997. Sources of animal science research information: usefulness and reliability. *Journal of Animal Science* 75:331-338.
- Owusu-Frimpong, N.** 2008. An evaluation of customers' perception and usage of rural community banks (RCBs) in Ghana. *International Journal of Emerging Markets* 3(2):181-196.
- Oxfam Great Britain (GB).** 2000. Agricultural trade and the livelihoods of small farmers: discussion paper for DFID towards development of a White Paper on Globalisation.
- Oxford English dictionary.** 2006. Oxford: Oxford University Press.
- Oyedele, G. A., J. O. Akintola, M. A. Y. Rahji and B. T. Omonona.** 2009. Credit constrained condition of farm households and profitability of agricultural production in Nigerian agriculture. *Agricultural Journal* 4(4):192-201.
- Oyedele, O. O. and Yahaya, M. K.** 2009. Citrus farmers' accessibility to horticultural information in South-western Nigeria. *Acta Horticulturae* 832:171-176.
- Participatory Ecological Land-Use Management (PELUM), Promoting Local Innovation (PROLINNOVA) and Oxfam Novib.** 2006. Workshop report on Exchange and Capacity Building Workshop on Farmer-Led Documentation for Sustainable Agriculture / Natural



- Resource Management. 6 –10 November 2006. Hotel Africana - Kampala, Uganda.  
<[http://www.prolinnova.net/Downloadable\\_files/33196%20FLD%20Workshop%20Proceedings%20Final.pdf](http://www.prolinnova.net/Downloadable_files/33196%20FLD%20Workshop%20Proceedings%20Final.pdf)> Accessed 6 April 2007.
- Patton, M. Q.** 2002. *Qualitative research and evaluation methods*. 3rd ed. Thousand Oaks: Sage Publications.
- Peil, M. and D. Rimmer.** 1995. *Social science research methods: a handbook for Africa*. 2nd ed. Nairobi: East African Educational Publishers.
- Peters, T. J. and N. Austin.** 1994. *A passion for excellence: the leadership difference*. London: Harper Collins Publishers.
- Petersen, W.** 1997. The context of extension in agricultural and rural development. In: Swanson, B. E., R. P. Bentz and A. J. Sofranko. (eds). *Improving agricultural extension: a reference manual*. Rome: FAO. <<http://www.fao.org/docrep/W5830E/w5830e05.htm>> 15 December 2007.
- Phillips, E. M. and D. S. Pugh.** 2005. *How to get a PhD: a handbook for students and their supervisors*. 4th ed. Berkshire: Open University.
- Phillips, J. M.** 1994. Farmer education and farmer efficiency: a meta-analysis. *Economic Development and Cultural Change* 43(1):149-165.
- Pickering, W. R.** 1996. Principia informatica: conversations with R. T. Bottle. *Journal of Information Science* 22(6):447-456.
- Pidatala, K. and A. R. Khan.** 2003. Women and indigenous knowledge: a south-south perspective. *IK Notes* 63 December. Washington: The World Bank.
- Pike, T.** 2008. Understanding behaviours in a farming context: bringing theoretical and applied evidence together from across Defra and highlighting policy relevance and implications for future research. Defra Agricultural Change and Environment Observatory Discussion Paper <<https://statistics.defra.gov.uk/esg/ace/research/pdf/ACEO%20Behaviours%20Discussion%20Paper%20Final.pdf>> 20 November 2009.
- Pinard, B.** 1996. A case study on the agricultural knowledge and information system of region 4 of Quebec: shedding light on institutional changes supporting sustainable agriculture. M. Sc. thesis. Guelph: University of Guelph. (abstract).
- Piper, H. and H. Simons.** 2005. Ethical responsibility in social research. In: Somekh, B. and C. Lewin. (eds). *Research methods in the social sciences*. London: Sage Publications. pp. 56-64.
- Place, F., G. Kariuki, J. Wangila, P. Kristjanson, A. Makauki and J. Ndubi.** 2004. Assessing the factors underlying differences in achievements of farmer groups: methodological issues and empirical findings from the highlands of Central Kenya. *Agricultural Systems* 82:257–272.
- Plato, I.** 1953. Phaedo 1, Gowler, H. N. Harvard: Harvard University Press / The Loeb Classical Library, Cambridge, MA pp. 117-124.
- Pokhrel, D. M. and G. B. Thapa.** 2007. Are marketing intermediaries exploiting mountain farmers in Nepal? A study based on market price, marketing margin and income distribution analyses. *Agricultural Systems* 94:151-164.
- Polit, D. F. and C. T. Beck.** 2004. *Nursing research: principles and methods*. 7th ed. New York: Lippincott Williams and Wilkins.
- Poole, H.** 1985. *Theories of the middle range*. Norwood: Ablex Publishing Corporation.
- Poole, J.** 2004. Measurements. In Patel, B. K., K. Muir-Leresche, R. Coe and S. D. Hainsworth. (eds). *The green book: a guide to effective graduate research in African agriculture, environment and rural development*. Kampala: African Crop Science Society. pp. 171-181.
- Popper, K. R.** 1994. *The myth of the framework: in defence of science and rationality*. London: Routledge.
- Poupyrev, I., S. Maruyama and J. Rekimoto.** 2002. Ambient touch: designing tactile interfaces for handheld devices. Proceedings of the 15<sup>th</sup> annual ACM symposium on user interface software and technology. <[http://ivanpoupyrev.com/e-library/2002/uist2002\\_ambienttouch.pdf](http://ivanpoupyrev.com/e-library/2002/uist2002_ambienttouch.pdf)> 18 January 2010.
- Powell, M.** 2003. *Information management for development organisations*. 2nd ed. Oxford: Oxfam GB.
- Powell, R. R. and L. S. Connaway.** 2004. *Basic research methods for librarians*. 4th ed. Westport: Libraries Unlimited.
- Prasad, S. and S. V. Rasheed.** 2005. An innovation systems study on fodder innovations project on enhancing livelihoods of poor livestock keepers in Krishna and Guntur districts of Andhra Pradesh. Hyderabad: CRISP and ILRI.

- Pratt, B. and P. Loizos.** 1992. *Choosing research methods: data collection for development workers*. London: Oxfam UK.
- Pretty, J.** 1994. Alternative systems of inquiry for a sustainable agriculture. *IDS Bulletin* 25(2):37-48.
- Pretty, J.** 1998. Supportive policies and practice for scaling up sustainable agriculture. In: Röling, N. G. and M. A. E. Wagemakers. (eds). *Facilitating sustainable agriculture: participatory learning and adaptive management in times of environmental uncertainty*. Cambridge: Cambridge University Press. pp. 23-45.
- Pretty, J.** 2003a. Social capital and connectedness: issues and implications for agriculture, rural development and natural resource management in ACP countries. A review paper for CTA. CTA Working Paper Number 8032. Wageningen: CTA.  
<<http://www.cta.int/pubs/wd8032/WD8032.pdf>> 5 February 2008.
- Pretty, J.** 2003b. Social capital and the collective management of resources. *Science* 302:1912-1914.
- Pretty, J.** 2008. Investments in collective capacity and social capital. In: Bossio, D. and K. Geheb. (eds). *Conserving land, protecting water*. Wallingford: CABI. pp. 178-190.
- Pretty, J. and G. Wesseler.** 2004. Connectedness and social capital: implications for agricultural and rural development. In: *CTA Annual Report 2003*. Wageningen: CTA. pp. 3-14.
- Pretty, J. and R. Chambers.** 1994. Towards a learning paradigm: new professionalism and institutions for a sustainable agriculture. In: Scoones, I. and J. Thompson. (eds). *Beyond farmer first: rural people's knowledge, agricultural research and extension practice*. London: IIED. pp. 182-202.
- Pretty, J. and S. D. Vodouhe.** 1997. Using rapid or participatory appraisal. In: Swanson, B. E., R. P. Bentz and A. J. Sofranko. (eds). *Improving agricultural extension: a reference manual*. Rome: FAO. pp. 47-55.
- Probst, G., S. Raub and K. Romhardt.** 1999. *Managing knowledge: building blocks for success*. New York: John Wiley.
- Probst, G., S. Raub and K. Romhardt.** 2000. *Managing knowledge: building blocks for success*. Chichester: John Wiley and Sons.
- Promoting Local Innovation (PROLINNOVA).** 2010. <<http://www.prolinnova.net/>> 24 February 2010.
- Putnam, R.** 2001. Social capital: measurement and consequences. In: OECD and HRDC. (eds). *The contribution to human and social capital to sustained economic growth and well-being*. International symposium report. <<http://www.oecd.org/dataoecd/25/6/1825848.pdf>> 15 January 2010.
- Qiang, C. S-W., C. M. Rossotto and K. Kimura** 2009. Economic impacts of broadband. In: The World Bank. *Information and communications for development 2009: extending reach and increasing impact*. Washington: The World Bank. pp. 35-50.
- Rajasekaran, B., R. A. Martin and D. M. Warren.** 1993. A framework for incorporating indigenous knowledge systems into agricultural extension. *IK Monitor* 1(3):21-24.
- Ramirez, R.** 1997. Understanding farmers' communication networks: combining PRA with agricultural knowledge systems analysis. Gatekeeper Series no. 66. London: IIED.
- Ramirez, R.** 1998. Communication: a meeting ground for sustainable development. In: Richardson, D. and Paisley, L. (eds). *The first mile of connectivity: advancing telecommunications for rural development through a participatory communication approach*. Rome: FAO. pp. 38-59.
- Ramirez, R. and W. Quarry.** 2004. Communication strategies in the age of decentralisation and privatisation of rural services: lessons from two African experiences. Agricultural Research and Extension Network (AgREN) Paper no. 136. London: Overseas Development Institute.
- Rangi, D., R. Day, J. F. Asaba, H. Munyua and M. Kimani.** 2002. Knowledge markets: information supply and demand in small-scale rural agriculture. In: *Challenges in rural development and poverty alleviation in Eastern and Southern Africa: the role of civil society and development institutions*. IFAD/NGO workshop, Nairobi, Kenya. 6-9 May 2002.
- Rao, A. B.** 2005. *Quantitative techniques in business*. 2nd ed. Delhi: Jaico Publishing.
- Rao, S. S.** 2006. Indigenous knowledge organization: an Indian scenario. *International Journal of Information Management* 26:224-233.
- Raseroka, K.** 2008. Information transformation Africa: indigenous knowledge -securing space in the knowledge society. *The International Information and Library Review* 40:243-250.

- Rausch, A.** 2001. Farm and family connections: involving the family in goal setting and decision making. Farm Business Management for the 21st Century Series ID-241  
<<http://www.agecon.purdue.edu/ext/fbm21>> 15 January 2010.
- Rausch, E.** 1996. Appropriate techniques in decision making: part 1. *Management Development Review* 9(2):35-39.
- Reason, P. and H. Bradbury.** (eds). 2001. *Handbook of action research: participatory inquiry and practice*. London: Sage Publications.
- Rees, D. J., C. Nkonge, J. O Ogecha, I. W. Kariuki, C. M. Luswet, F. M. Muyekho and D. T. Cheruiyot.** 1999a. Advantages and disadvantages of working with farmer research groups and farmer expert panels. In: Sutherland, J. A. (ed.) *Towards increased use of demand driven technology*. Pre-conference mini-papers prepared for the KARI/DFID NARP II Project. End of Project Conference, 23-26 March 1999, Nairobi Kenya. pp. 4-9.
- Rees, D. J., M. Momanyi, J. Wekundah, D. Andima, M. Kamau, J. Ndubi, F. Ndungu, S. Oyure and J. Odondi.** 1999b. Agricultural knowledge and information systems in Trans-Nzoia and West Pokot – implications for demand-driven research and agricultural development. In: Sutherland, J. A. (ed.) *Towards increased use of demand driven technology*. Pre-conference mini-papers prepared for the KARI/DFID NARP II Project. End of Project Conference, 23-26 March 1999, Nairobi Kenya. pp. 547-556.
- Rees, D. J., M. Momanyi, J. Wekundah, F. Ndungu, J. Odondi, A. O. Oyure, D. Andima, M. Kamau, J. Ndubi, F. Musembi, L. Mwaura and R. Joldersma.** 2000. Agricultural knowledge and information systems in Kenya: implications for technology dissemination and development. Agricultural Research and Extension Network (AgREN) Network Paper no. 107. London: Overseas Development Institute.
- Rege, R.** 2006. Harnessing institutional alliances and partnerships in agricultural information systems in Kenya. *IAALD Quarterly Bulletin* LI(3/4):215-222.
- Regional Universities Forum for Capacity Building in Agriculture (RUFORUM).** 2010. E-content development & staff retooling workshop (11-15 January 2010). Egerton University, Njoro, Kenya. <<http://www.ruforum.org/drupal/sites/default/files/workshop%20report.pdf>> 10 May 2010.
- Reij, C. and A. Waters-Bayer.** 2001a. Entering research and development in land husbandry through farmer innovation. In: Reij, C. and A. Waters-Bayer. (eds). *Farmer innovation in Africa: a source of inspiration for agricultural development*. London: Earthscan. pp. 3-22.
- Reij, C. and A. Waters-Bayer.** 2001b. An initial analysis of farmer innovators and their innovations. In: Reij, C. and A. Waters-Bayer. (eds). *Farmer innovation in Africa: a source of inspiration for agricultural development*. London: Earthscan. pp. 77-91.
- Renko, N., S. Nikolasevic and J. Pavicic.** 2002. The market information system and state support for the market of agricultural products in Croatia. *British Food Journal* 104(2):543-571.
- Republic of Kenya (RoK).** 2002. National development plan: 2002-2008. Effective management for sustainable economic growth and poverty reduction. Nairobi: Republic of Kenya.
- Republic of Kenya (RoK).** 2003. Economic recovery strategy for wealth and employment creation. Nairobi: Republic of Kenya.
- Republic of Kenya (RoK).** 2004. Investment programme for the economic recovery strategy for wealth and employment creation: 2003-2007. Revised. Nairobi: Republic of Kenya.
- Republic of Kenya (RoK).** 2005a. Strategy for revitalizing agriculture: 2004-2014. Short version. Nairobi: Ministry of Agriculture, Ministry of Livestock and Fisheries Development and Ministry of Cooperative Development and Marketing.
- Republic of Kenya (RoK).** 2005b. National export strategy implementation action plan 2005-2008. Nairobi: Republic of Kenya.
- Republic of Kenya (RoK).** 2007. Sessional paper on national food and nutrition policy (draft). Nairobi: Republic of Kenya.
- Republic of Kenya (RoK).** 2010a. Youth empowerment project. Environmental and social management policy framework (ESMF).  
<<http://www.primeminister.go.ke/DOCS/ESMF.pdf>> 1 May 2010.
- Republic of Kenya (RoK).** 2010b. Agricultural sector development strategy (ASDS).  
<http://www.ascu.go.ke/reform-asds.cfm>> 23 March 2010.



- Republic of Kenya (RoK). Central Bureau of Statistics, Ministry of Finance and Planning.** 2006. *Economic survey 2006*. Nairobi: Republic of Kenya.
- Republic of Kenya (RoK). Central Bureau of Statistics, Ministry of Planning and National Development.** 2007. *Statistical Abstract 2006*. Nairobi: Central Bureau of Statistics.
- Republic of Kenya (RoK). Kenya Agricultural Productivity and Agribusiness Project (KAPAP).** 2009. Indigenous peoples planning framework (Ogiek and Sengwer). IPP 349. Nairobi: KAPAP. <[http://www-wds.worldbank.org/external/default/WDSPContentServer/WDSP/IB/2009/06/30/000333038\\_20090630014245/Rendered/PDF/IPPF3490Revised1P1IPPF1final1version.pdf](http://www-wds.worldbank.org/external/default/WDSPContentServer/WDSP/IB/2009/06/30/000333038_20090630014245/Rendered/PDF/IPPF3490Revised1P1IPPF1final1version.pdf)> 30 March 2010.
- Republic of Kenya (RoK). Kenya National Bureau of Statistics (KNBS).** 2006. *Economic survey 2006*. Nairobi: KNBS.
- Republic of Kenya (RoK). Kenya National Bureau of Statistics (KNBS).** 2008a. *Economic survey 2008*. Nairobi: KNBS.
- Republic of Kenya (RoK). Kenya National Bureau of Statistics (KNBS).** 2008b. *Well-being in Kenya: a socio-economic profile*. Nairobi: KNBS.
- Republic of Kenya (RoK). Kenya National Bureau of Statistics (KNBS).** 2009. *Kenya facts and figures 2009*. Nairobi: KNBS.
- Republic of Kenya (RoK). Kenya National Bureau of Statistics (KNBS). Ministry of Planning and National Development.** 2007a. *Economic survey 2007*. Nairobi: Kenya National Bureau of Statistics.
- Republic of Kenya (RoK). Kenya National Bureau of Statistics (KNBS). Ministry of Planning and National Development.** 2007b. *Basic report on well-being in Kenya based on Kenya Integrated Household Budget Survey – 2005/06*. Nairobi: Kenya National Bureau of Statistics.
- Republic of Kenya (RoK). Ministry of Agriculture.** 2006. *Strategic plan 2006-2010*. Nairobi: Ministry of Agriculture.
- Republic of Kenya (RoK). Ministry of Agriculture.** 2007a. *Economic review of agriculture 2007*. Nairobi: Ministry of Agriculture.
- Republic of Kenya (RoK). Ministry of Agriculture.** 2007b. *National nut crops development policy*. Nairobi: Ministry of Agriculture.
- Republic of Kenya (RoK). Ministry of Agriculture.** 2007c. *National policy on horticulture industry development*. Nairobi: Ministry of Agriculture.
- Republic of Kenya (RoK). Ministry of Agriculture and Ministry of Livestock and Fisheries Development.** 2004. *Strategy for revitalizing agriculture: 2004-2014*. Nairobi: Ministry of Agriculture and Ministry of Livestock and Fisheries Development.
- Republic of Kenya (RoK). Ministry of Agriculture and Ministry of Livestock and Fisheries Development.** 2007. *Workplan July 2007 – June 2008: National Agriculture and Livestock Extension Programme*. Nairobi: Ministry of Agriculture and Ministry of Livestock Development and Fisheries.
- Republic of Kenya (RoK). Ministry of Agriculture, Ministry of Livestock and Fisheries Development, Ministry of Cooperative Development and Marketing.** 2005. *Strategy for revitalizing agriculture: 2004-2014. Short version*. Nairobi: Ministry of Agriculture, Ministry of Livestock and Fisheries Development and Ministry of Cooperative Development and Marketing.
- Republic of Kenya (RoK). Ministry of Agriculture and Rural Development.** 2001a. *National Agriculture Extension Policy (NAEP)*. Nairobi: Ministry of Agriculture and Rural Development.
- Republic of Kenya (RoK). Ministry of Agriculture and Rural Development.** 2001b. *National Agriculture and Livestock Extension Programme (NALEP: implementation framework)*. Nairobi: Ministry of Agriculture and Rural Development.
- Republic of Kenya (RoK). Ministry of Agriculture, Ministry of Livestock and Fisheries Development, Ministry of Cooperative Development and Marketing.** 2005. *Strategy for revitalizing agriculture: 2004-2014. Short version*. Nairobi: Ministry of Agriculture, Ministry of Livestock and Fisheries Development and Ministry of Cooperative Development and Marketing.

- Republic of Kenya (RoK). Ministry of Finance and Planning.** 2000. *Second report on poverty in Kenya. Volume II: poverty and social indicators.* Nairobi: Ministry of Finance and Planning.
- Republic of Kenya (RoK). Ministry of Finance and Planning.** 2001. *Poverty reduction strategy paper for the period 2001 – 2004.* Nairobi: Ministry of Finance and Planning.
- Republic of Kenya (RoK). Ministry of Finance and Planning.** 2002a. Kirinyaga district development plan: 2002-2008. Effective management for sustainable economic growth and poverty reduction. Nairobi: Government Printer.
- Republic of Kenya (RoK). Ministry of Finance and Planning.** 2002b. *National development plan: 2002-2008. Effective management for sustainable economic growth and poverty reduction.* Nairobi: Republic of Kenya.
- Republic of Kenya (RoK). Ministry of Finance and Planning.** 2007. *Economic survey 2006.* Nairobi: Central Bureau of Statistics.
- Republic of Kenya (RoK). Ministry of Information and Communications.** 2006. National information and communications technology (ICT) policy. Nairobi: Ministry of Information and Communications.
- Republic of Kenya (RoK). Ministry of Planning and National Development.** 2006. *Annual progress report: 2004/2005. Investment Programme for the Economic Recovery Strategy for Wealth and Employment Creation.* Nairobi: Republic of Kenya.
- Republic of Kenya (RoK). National Agriculture and Livestock Extension Programme (NALEP).** 2008. Improving extension through ICT. Launching of the NAFIS. *Daily Nation*, Tuesday April 29, p. 34-35.
- Republic of Kenya (RoK). National Economic and Social Council of Kenya (NESC).** 2007. Kenya vision 2030: the popular version. Nairobi: Republic of Kenya.
- Republic of Kenya (RoK). Office of the President.** 1999. *National poverty eradication plan: 1999-2015.* Nairobi: Office of the President.
- Republic of Kenya (RoK). Office of the President.** 2006. *The making of Kenya: Vision 2030.* Nairobi: Office of the President.
- Republic of Kenya (RoK). Office of the President. Ministry of State for Planning. National Development and Vision 2030.** 2008. Kenya Vision 2030: first medium term plan (2008-2012). Nairobi: Government of the RoK.
- Republic of Kenya (RoK). Office of the Prime Minister. Ministry of State for Planning. National Development and Vision 2030.** 2008. *First medium term plan, 2008-2012. Kenya Vision 2030.* Nairobi: Office of the Prime Minister.
- Richards, L.** 2006. *Up and running in your project: a post-workshop handbook for NVivo 7.* <[http://download.qsrinternational.com/Document/NVivo7/NVivo7\\_Up&Running\\_Lyn\\_Richards.pdf](http://download.qsrinternational.com/Document/NVivo7/NVivo7_Up&Running_Lyn_Richards.pdf)> 24 April 2009.
- Richardson, D.** 1996. *The Internet and rural development: recommendations for strategy and activity.* Rome: FAO.
- Richardson, D.** 1999. *The Internet and rural and agricultural development: an integrated approach.* Rome: FAO. <<http://www.fao.org/WAICENT/FAOINFO/SUSTDEV/CDdirect/CDre0041.htm>> 25 March 2007
- Richardson, D.** 2006. ICTs – transforming agricultural extension. Report of the 6<sup>th</sup> Consultative Expert Meeting of CTA's Observatory on ICTs. CTA Working Document no. 8034. Wageningen: CTA. <[http://www.anancy.net/uploads/file\\_en/WD8034.pdf](http://www.anancy.net/uploads/file_en/WD8034.pdf)> 14 December 2007.
- Ritchie, J.** 2003. The applications of qualitative methods to social research. In: Ritchie, J. and J. Lewis. (eds). *Qualitative research practice: a guide for social science students and researchers.* London: Sage Publications. pp. 24-46.
- Ritchie, J. and J. Lewis. (eds).** 2003. *Qualitative research practice: a guide for social science students and researchers.* London: Sage Publications.
- Ritchie, J., J. Lewis and G. Elam.** 2003. Designing and selecting samples. In: Ritchie, J. and J. Lewis. (eds). *Qualitative research practice: a guide for social science students and researchers.* London: Sage Publications. pp. 77-108.



- Rivera, W. M.** 2006. Agricultural knowledge and development in a new age and different world *Journal of International Agricultural Education and Extension* 13(2):57-67.
- Rivera, W. M. and G. Alex.** (eds). 2004. Extension Reform for Rural Development series Volume 5. National strategy and reform process: case studies of international initiatives. Agriculture and Rural Development Discussion Paper 12. Washington: The World Bank.
- Rivera, W. M. and G. Alex.** 2004. The continuing role of government in pluralistic extension services. *Journal of International Agricultural Extension Education* 11(3):41-51.
- Rivera, W. M. and M. K. Qamar.** 2003. *Agricultural extension, rural development and food security challenge*. Rome: FAO.
- Rivera, W. M., M. K. Qamar and H. K. Mwandemere.** 2005. *Enhancing coordination among AKIS/RD actors: an analytical and comparative review of country studies on agricultural knowledge and information systems for rural development*. Rome: FAO.  
<[http://www.fao.org/sd/dim\\_kn3/docs/kn3\\_050901d\\_en.pdf](http://www.fao.org/sd/dim_kn3/docs/kn3_050901d_en.pdf)> 20 March 2008.
- Rivera, W. M., M. K. Qamar, L. Van Crowder.** 2001. *Agricultural and rural extension world wide: options for institutional reforms in developing countries*. Rome: FAO.
- Rivera, W. M. and V. R. Sulaiman.** 2010. Extension: object of reform, engine for innovation. *Rural Development News* 1:64-69. <[http://siteresources.worldbank.org/INTARD/825826-1111129171182/20431857/Extension\\_Reform\\_V5\\_final.pdf](http://siteresources.worldbank.org/INTARD/825826-1111129171182/20431857/Extension_Reform_V5_final.pdf)> 21 May 2010.
- Rocco, T. S., L. A. Bliss, S. Gallagher and A. Pérez-Praado.** 2003. Taking the next step: mixed methods research in organizational systems. *Information Technology, Learning, and Performance Journal* 21(1):19-28.
- Rogers, E. M.** 1983. *Diffusion of innovations*. 3rd ed. New York: The Free Press.
- Rogers, E. M. and F. F. Shoemaker.** 1971. *Communication of innovations: a cross-cultural approach*. 2nd ed. New York: The Free Press.
- Röling, N. G.** 1988. *Extension science: information systems in agricultural development*. WYE Studies in Agricultural and Rural Development. Oxford: Oxford University Press.
- Röling, N. G.** 1989. *A research/extension interface: a knowledge system perspective*. Wageningen: Wageningen Agricultural University.
- Röling, N. G.** 1992. The emergence of knowledge systems thinking: a changing perception of relationships among innovation, knowledge process and configuration. *Knowledge and Policy* 5(1):42-65.
- Röling, N. G.** 1995. What to think of extension? A comparison of three models of extension practice. Article for francophone issue of AERDD Bulletin. Salamna, N. (ed.) Montpellier: ICRA.  
<[http://wbln0018.worldbank.org/essd/susint.nsf/179fd64072f72bbf852569d1004de1e5/f777fee31f89404a852569d800780b87/\\$FILE/Extension.pdf](http://wbln0018.worldbank.org/essd/susint.nsf/179fd64072f72bbf852569d1004de1e5/f777fee31f89404a852569d800780b87/$FILE/Extension.pdf)> 6 January 2008.
- Röling, N. G.** 2004. Communication for development in research, extension and education. Paper presented at the 9th UN Roundtable on Communication for Development 6-9 September 2004, Rome, Italy. <<http://www.fao.org/nr/com/gtzworkshop/RolingPaperENG.pdf>> 6 May 2010.
- Röling, N. G.** 2007. Endogenous development and resilience: the institutional dimension. In: Haverkort, B. and S. Rist. (eds). *Endogenous development and resilience: the institutional dimension*. Leusden: Compas.  
<<http://www.bioculturaldiversity.net/Downloads/Papers%20participants/Roeling.pdf>> 10 March 2010.
- Röling, N. G., D. Hounkonnou, S. K. Offei, R. Tossou and A. Van Huis.** 2004. Linking science and farmers' innovative capacity: diagnostic studies from Ghana and Benin. *NJAS* 52(3/4):211-235.
- Röling, N. G. and E. de Fliert.** 1998. Introducing integrated pest management in rice in Indonesia: a pioneering attempt to facilitate large scale change. In: Röling, N. G. and M. A. E. Wagemakers. (eds). *Facilitating sustainable agriculture: participatory learning and adaptive management in times of environmental uncertainty*. Cambridge: Cambridge University Press. pp. 153-171.
- Röling, N. G. and J. Jiggins.** 1998. The ecological knowledge system. In: Röling, N.G. and M.A.E. Wagemakers. (eds). *Facilitating sustainable agriculture: participatory learning and adaptive*

- management in times of environmental uncertainty*. Cambridge: Cambridge University Press. pp. 283-311.
- Röling, N. G. and J. N. Pretty.** 1997. Extension's role in sustainable agriculture development. In: Swanson, B. E., R. P. Bentz and A. J. Sofranko. (eds). *Improving agricultural extension: a reference manual*. Rome: FAO. pp. 181-191.  
<<http://www.fao.org/docrep/W5830E/w5830e0m.htm>> 2 May 2007.
- Röling, N. G. and M. A. E. Wagemakers.** (eds). 1998. *Facilitating sustainable agriculture: participatory learning and adaptive management in times of environmental uncertainty*. Cambridge: Cambridge University Press.
- Rollet, H.** 2003. *Knowledge management: processes and technologies*. Boston: Kluwer Academic Publishers.
- Romanello, S.** 2005. Natural and social scientist perceptions of uncertainty: a study informed by Sense-Making methodology. Paper presented at a non-divisional workshop held at the meeting of the International Communication Association, May 2005, New York USA.
- Romanello, S., B. Dervin and R. Fortner.** 2003. Sense-Making as a methodology to inform interdisciplinary communication of scientific uncertainty of global climate change. Paper presented at a non-divisional workshop held at the meeting of the International Communication Association, San Diego, CA. <<http://communication.sbs.ohio-state.edu/sense-making/meet/2003/meet03romanellodervinfortner.html>> 24 April 2007.
- Rose, R.** 1999. What does social capital add to individual welfare? An empirical analysis of Russia. World Bank Social Capital Initiative Working Paper no. 15. Washington: The World Bank.
- Rosenberg, D.** 1993. Rural community resource centres: a sustainable option for Africa? *Information Development* 9(1/2):29-35.
- Rosenberg, D.** 1995. Information provision to rural communities in Africa: summary and conclusions. In: Johansson, E. (ed.) *Seminar on information provision to rural communities in Africa*. Proceedings of the seminar held in Gaborone, Botswana. 22-25 June 1994. pp. 134-139.
- Rosenberg, D.** 2001. The sustainability of libraries and resource centres in Africa. In: Stilwell, C., A. Leach and S. Burton. (eds). *Knowledge, information and development: an African perspective*. Pietermaritzburg: University of Natal. pp. 11-24.
- Rosenhead, J.** 1998. Complexity theory and management practice <<http://www.human-nature.com/science-as-culture/rosenhead.html>> 21 January 2008.
- Royal Tropical Institute (KIT).** 2007a. Knowledge for rural innovation. <<http://www.kit.nl/smartsite.shtml?id=2047&ch=FAb>> 12 October 2007.
- Royal Tropical Institute (KIT).** 2007b. Innovation. <<http://www.kit.nl/smartsite.shtml?id=5412>> 3 April 2007.
- Rubin, R. B., A. M. Rubin and P. M. Haridakis.** 2010. *Communication research: strategies and sources*. 7th ed. Boston: Wadsworth Centage Learning.
- Ruse, J.** 2006. Promoting sustainable producer group enterprises: a review of FAO experience (1981-2006). Lessons learned and ideas for the future. Rome: FAO. Rural Institutions and Participation Service (SDAR).
- Saha, H. M., M. B. Muli, A. M. Mzingirwa, J.M. Ndungu and K. K. Lewa.** 2009. Enhancing local innovation process: Scaling out benefits of technologies through farmer field school networks: a case study of INM technologies. Paper presented at the International Symposium on Agricultural Innovation Systems in Africa, 21-23 November 2006, Kampala, Uganda. <[http://www.innovationafrica.net/pdf/s6\\_muli\\_full.pdf](http://www.innovationafrica.net/pdf/s6_muli_full.pdf)> 18 November 2009.
- Salasya, B. and R. Hassan.** 1998. The gender factor in maize farming and technology transfer in Kenya. In: Curry, J., M. Kooijman and H. Recke. (eds). *Institutionalising gender in agricultural research: experiences from Kenya*. Proceedings of the Gender Conference. KARI Headquarters, Nairobi, Kenya 5-7 October 1998. Nairobi: KARI. pp. 77-88.
- Salaün, Y. and K. Flores.** 2001. Information quality: meeting the needs of the consumer. *International Journal of Information Management* 21:211-37.
- Salisbury, M. W.** 2003. Putting theory into practice to build knowledge management systems. *Journal of Knowledge Management* 7(2):128-41.

- Sallis, E. and G. Jones.** 2002. *Knowledge management in education: enhancing learning and education*. London: Kogen Page Ltd.
- Salomon, M. L. and P. G. H. Engel.** 1997a. *Networking for innovation: a participatory actor-oriented methodology*. Wageningen: Royal Tropical Institute.
- Salomon, M. L. and P. G. H. Engel.** 1997b. *Networking for innovation: windows and tools*. Wageningen: Royal Tropical Institute.
- Samah, B. A., H. Z. M. Shafril, M. D. S. Hassan, M. A. Hassan and N. Ismail.** 2009. Contribution of information and communication technology in increasing agro-based entrepreneurs productivity in Malaysia. *Journal of Agriculture and Social Sciences* 5(3):93-98.
- Samara, K.** 2007. A framework for discovering KM forces: the fifth element. *Journal of Knowledge Management Practice* 8(1) <<http://www.tlaint.com/article129.htm>> 19 February 2008.
- Sambodo, L. A. A. T.** 2007. The decision making processes of semi-commercial farmers: a case study of technology adoption in Indonesia. PhD. thesis. Lincoln: University of Lincoln.
- Somekh, B.** 2006. *Action research: a methodology for change and development*. London: Open University Press.
- Sanchez, P. A., G. Denning and G. Nziguheba.** 2009. The African green revolution moves forward. *Food Security* 1:37-44.
- Sanchez, P. A., K. D. Shepherd, M. J. Soule, F. M. Place, R. J. Buresh, A. M. Izac, A. U. Mikwunye, F. R. Kwesiga, C. G. Nderitu and P. L. Woomer.** 1997. Soil fertility replenishment in Africa: an investment in natural resource capital. In: Buresh, R. J., P. A. Sanchez and F. G. Calhoun. (eds). *Replenishing soil fertility in Africa*. SSSA. Special publication no. 51. Madison: Soil Science Society of America. pp. 1-46.
- Sanchez, P., M. S. Swaminathan, P. Dobie, N. Yuksel.** 2005. Halving hunger: it can be done. New York: United Nations Development Programme.
- Santilli, J.** 2006. Cultural heritage and collective intellectual property rights. *IK Notes* no. 95 August. Washington: The World Bank.
- Sapsford, R. and V. Jupp.** (eds). 2006. *Data collection and analysis*. 2nd ed. London: Sage Publications.
- Saway, D. V. L.** 2004. Global responsibility and local knowledge systems. A millennium assessment paper presented during the Bridging Scales and Epistemologies in the Millennium Ecosystem Assessment Conference, Alexandria, Egypt 17-20 March 2004. <<http://ma.caudillweb.com/documents/bridging/papers/saway.datu.pdf>> 21 February 2008.
- Scarr, M. J., D. J. Rees, J. N. Chui, R. Joldersma and E. P. Hoare.** 1999. Packaging and dissemination of research messages. In: Sutherland, J. A. (ed.) Towards increased use of demand driven technology. Pre-conference mini-papers prepared for the KARI/DFID NARP II Project. End of Project Conference, 23-26 March 1999, Nairobi Kenya. pp. 573-576.
- Schunk, D. H.** 2008. *Learning theories: an educational perspective*. 5th ed. New Jersey: Pearson Merrill Prentice Hall.
- Scoones, I. and J. Thompson.** 1993. *Challenging the populist perspective: rural people's knowledge, agricultural research and extension practice*. Institute of Development Studies Discussion Paper 332. Brighton: IDS-IIED.
- Scoones, I. and J. Thompson.** 1994. Knowledge, power and agriculture: towards a theoretical understanding. In: Scoones, I. and J. Thompson. (eds). *Beyond farmer first: rural people's knowledge, agricultural research and extension practice*. London: IIED. pp. 16-32.
- Sekaran, U.** 2003. *Research methods for business: a skill-building approach*. 4th ed. New York: John Wiley and Sons.
- Sen, B.** 2005. Indigenous knowledge for development: bringing research and practice together. *The International Information and Library Review* 17:375-382.
- Senge, P. M.** 2006. *The fifth discipline: the art and practice of learning organisations*. New York: Doubleday.
- Sey, J.** 2006. Postmodernism: a critical practice. In: Terre Blanche, M., K. Durrheim and D. Painter. (eds). *Research in practice: applied methods for the social sciences*. 2nd ed. Cape Town: University of Cape Town. pp. 523-537.

- Sharp, J. S. and M. B. Smith.** 2003. Social capital and farming at the rural-urban interface: the importance of nonfarmer and farmer relations. *Agricultural Systems* 76:913-927.
- Shaughnessy, J. J., E. B. Zechmeister and J. S. Zechmeister.** 2003. *Research methods in psychology*. 6th ed. Boston: McGraw-Hill.
- Shepard, J. M.** 2009. *Sociology*. 10th ed. Belmont: Wadsworth Cengage Learning.
- Sheppard, M.** 2004. *Appraising and using social research in the human services: an introduction for social work and health professionals*. London: Jessica Kingsley Publishers.
- Shibanda, G. G.** 1999. Optimising fisheries information for decision making among Kenyan fish pond smallholders. *Library Review* 48(8):408-412.
- Shibanda, G. G. and A. Seru.** 2002. Human resource strategy for Kenyan women smallholders. *Women in Management Review* 17(6):285-296.
- Shrestha, R. B.** 1996. Trees: farmers' response to change. *ILEIA Newsletter* 12(1):20.
- Skyrme, D. J.** 1997. From information management to knowledge management: are you prepared? <<http://www.skyrme.com/pubs/on97full.htm>> 18 April 2007.
- Skyrme, D. J.** 1999. Knowledge management: making it work. *The Law Librarian* 31(2):84-90.
- Skyrme, D. J.** 2002. Knowledge management: approaches and policies. <[http://www.providersedge.com/docs/km\\_articles/KM - Approaches and Policies.pdf](http://www.providersedge.com/docs/km_articles/KM_-_Approaches_and_Policies.pdf)> 20 February 2010.
- Small, A. and P. Irvine.** 2006. Towards a framework for organizational learning. *The Learning Organization* 13(3):276-299.
- Smith, A. C. T.** 2005. Complexity theory for organisational futures studies. *Foresight* 7(3):22-30.
- Smith, A. C. T. and F. Graetz.** 2006. Complexity theory and organizing form dualities. *Management Decision* 44(7):851-870.
- Smith, M. K.** 1999. The social/situational orientation to learning, the encyclopedia of informal education <[www.infed.org/biblio/learning-social.htm](http://www.infed.org/biblio/learning-social.htm)> 18 July 2007.
- Smith, M. K.** 2003. 'Communities of practice', the encyclopedia of information education. <[www.infed.org/biblio/communities\\_of\\_practice.htm](http://www.infed.org/biblio/communities_of_practice.htm)> 17 July 2007.
- Smith, M. L.** 2006. Overcoming theory-practice inconsistencies: critical realism and information systems research. *Information and Organization* 16(3):191-211. (abstract).
- Smith, P. A. C.** 2005. Knowledge sharing and strategic capital: the importance and identification of opinion leaders. *The Learning Organization* 12(6):563-574.
- Snape, D. and L. Spencer.** 2003. The foundations of qualitative research. In: Ritchie, J. and J. Lewis. (eds). *Qualitative research practice: a guide for social science students and researchers*. London: Sage Publications. pp. 1-23.
- Snowden, D.** 2000. Cynefin, a sense of time and place: an ecological approach to sense making and learning in formal and informal communities. In: Depres, C. and D. Chauvel. (eds). *Knowledge horizons, the present and the promise of knowledge management*. Oxford: Butterworth.. <<http://www.knowledgeboard.com/library/cynefin.pdf>> 22 January 2008.
- Snowden, D.** 2002a. Complex acts of knowing: paradox and descriptive self-awareness. *Journal of Knowledge Management* 6(2):100-111.
- Snowden, D.** 2002b. Being efficient does not always mean being effective: a new perspective on cultural issues in organisations. <[http://www.cognitive-edge.com/ceresources/articles/42\\_new\\_perspective\\_on\\_culture\\_final.pdf](http://www.cognitive-edge.com/ceresources/articles/42_new_perspective_on_culture_final.pdf)> 25 July 2008.
- Snowden, D.** 2005a. Strategy in the context of uncertainty. *Handbook of Business Strategy* 6(1):47-54.
- Snowden, D.** 2005b. From atomism to networks in social systems. *The Learning Organisation* 12(6):52-562.
- Snowden, D.** 2005c. Multi-ontology sense making: a new simplicity in decision making. *Informatics in Primary Care* 13(1):45-54.
- Snowden, D. and M. E. Boone.** 2007. A leader's framework for decision making. *Harvard Business Review* November:69-76.
- Snowden, D. and P. Stanbridge.** 2004. The landscape of management: creating the context for understanding social complexity. *Emergence: Complexity and Organization* 6(1/2):140-148.



- Snyman, M.** 2002. Getting information to disadvantaged rural communities: the centre approach of the South African government. In: Bothma, T. and A. Kaniki. (eds). *Proceedings of the second biennial DISSAnet Conference*, Pretoria. 24-25 October 2004. pp. 333-345.
- Sobel, J.** 2002. Can we trust social capital? *Journal of Economic Literature* XL:139-154.
- Solano, C., H. León, E. Pérez and M. Herrero.** 2001. Who makes farming decisions? A study of Costa Rican dairy farmers. *Agricultural Systems* 67(2001):181-199.
- Solano, C., H. León, E. Pérez and M. Herrero.** 2003. The role of personal information sources on the decision making process of Costa Rican dairy farmers. *Agricultural Systems* 76:3-18.
- Somekh, B.** 2006. *Action research: a methodology for change and development*. Maidenhead: Open University press.
- Somekh, B. and C. Lewin.** (eds). 2005. *Research methods in the social sciences*. London: Sage Publications.
- South Africa, Department of Agriculture.** 1995. White paper on agriculture 1995. Pretoria: Republic of South Africa.
- Spallek, P.** 2007. Knowledge as a factor of production: how to make it effective with knowledge management methods. GTZ Services for Rural Development no. 16 Wiesbaden: GTZ.
- Spender, J. C.** 2006. Method, philosophy and empirics in KM and IC. *Journal of Intellectual Capital* 7(1):12-28.
- Spielman, D. J.** 2005. Innovation systems perspectives on developing-country agriculture: a critical review. ISNAR Discussion Paper 2. Washington: IFPRI-ISNAR Division.
- Spurgin, K. M.** 2006. The Sense-Making approach and the study of personal information management. Personal Information Management – A SIGIR 2006 Workshop. Seattle, Washington. 10-11 Aug. 2006. pp. 102-104.  
<<http://pim.ischool.washington.edu/pim06/files/spurgin-paper.pdf>> 24 May 2007.
- Stack, J.** 2004. Using secondary data sources. In: Patel, B. K., K. Muir-Leresche, R. Coe and S. D. Hainsworth. (eds). *The green book: a guide to effective graduate research in African agriculture, environment and rural development*. Kampala: African Crop Science Society. pp. 115-127.
- Stacy, R.** 2001. *Complex responsive processes in organizations: learning and knowledge creation*. Routledge: London.
- The Standard.** 2010. EU sets up digital village for pastoralists. *The Standard* May 26 2010 p.31.
- Stefano, L. A.** 2004. Printed information access, preferences and use by farmers with potential for small-scale organic production, KwaZulu-Natal. M. Agric (Food Security) thesis. Pietermaritzburg: UKZN.
- Stefano, L. A., C. Stilwell, C. Morris and S. L. Hendriks.** 2009. Co-research to investigate the agriculture knowledge and information system at Embo. In: Hendriks, S. L. and M. C. Lyne. (eds). *Does food security improve when smallholders access a niche market? Lessons from the Embo Community in South Africa*. Pietermaritzburg: The African Centre for Food Security. pp. 43-52.
- Stefano, L. A., C. Stilwell, C. Morris, S. L. Hendriks, D. Miya, T. Mkhize, T. Makhanya, M. Makhanya, G. Ndlovu and D. Sabelo.** 2005a. An action research study of the agricultural knowledge and information systems of small-scale commercial organic farmers in Umbumbulu, KwaZulu-Natal. Food Security Programme Project Brief no. 2. Pietermaritzburg: University of KwaZulu-Natal.  
<<http://www.ukzn.ac.za/foodsecurity/publications/papers/FS%20publications/Brief%20%20Stefano.doc>> 6 April 2007.
- Stefano, L. A., S. L. Hendriks, C. Stilwell and C. Morris.** 2005b. Printed information needs of small-scale organic farmers in KwaZulu-Natal. *Libri* 55:56-66.
- Steiner, K. G.** 1998. Using farmers' knowledge of soils in making research results more relevant to field practice: experiences from Rwanda. *Agriculture, Ecosystems and the Environment* 69:191-200.
- Stevens, J. B.** 2007. Professional extension support: a prerequisite for sustainable irrigation development. M. Sc. thesis. Pretoria: University of Pretoria.
- Stewart, D. W.** 1984. *Secondary research: information sources and methods. Applied Social Research Methods Series Volume 4*. London: Sage Publications.
- Steyaert, P., M. Barzman, J-P. Billaud, H. le nè Brives, B. Hubert, G. Ollivier, B. ne dicte Roche.** 2007. The role of knowledge and research in facilitating social learning among

- stakeholders in natural resources management in the French Atlantic coastal wetlands. *Environmental Science and Policy* 10:537-550.
- Stillwell, W. D.** 2004. Tacit knowledge and the work of Ikujiro Nonaka: adaptations of Polanyi in a business context. *Tradition and Discovery* 30(1):19-23.
- Stilwell, C.** 1999. Community information services: a view of the theoretical foundations. *DESIDOC Bulletin of Information Technology* 19(1):15-33.
- Stilwell, C.** 2000. Global information issues: LIS educators and the public good. *Library Management* 21(2):188-191.
- Stilwell, C.** 2001a. Community resource centres: a turn of the century update. In: C. Stilwell, A. Leach and S. Burton. (eds). *Knowledge, information and development: an African perspective*. Pietermaritzburg: University of Natal. pp. 200-214.  
<<http://www.infs.ukzn.ac.za/kiad/14stilw.doc>> 4 April 2007.
- Stilwell, C.** 2001b. Repackaging information: a review. In: Stilwell, C., A. Leach and S. Burton. (eds). *Knowledge, information and development: an African perspective*. Pietermaritzburg: University of Natal. pp. 40-64. <<http://www.infs.ukzn.ac.za/kiad/04stilw.doc>> Accessed 6 April 2007.
- Stilwell, C.** 2002. The case for informationally based social exclusion for sex workers: a South African explanatory study. *Libri* 52:67-77. <<http://www.librijournal.org/pdf/2002-2pp67-77.pdf>> 11 June 2009.
- Stilwell, C.** 2006. "Beyond reason and vanity?": some issues in academic journal publication in library and information studies. *South African Journal of Libraries and Information Science* 72(1):1-11.
- Stilwell, C.** 2008. Mapping the fit: library and information services and the national transformation agenda in South, Part 1. *South African Journal of Libraries and Information Science* 74(2):149-159.
- Stilwell, C.** 2009. Mapping the fit: library and information services and the national transformation agenda in South, Part 11. *South African Journal of Libraries and Information Science* 75(1):1-11.
- Stilwell, C. and H. Munyua.** 2009. The potential of information management for combating poverty and other forms of social exclusion. Keynote address presented at the Second School of Information Sciences Conference, Moi University, 6-8 July 2009, Eldoret, Kenya.
- Stilwell, C., A. Leach and S. Burton.** 2001. Introduction. In: Stilwell, C., A. Leach and S. Burton. (eds). *Knowledge, information and development: an African perspective*. Pietermaritzburg: University of Natal. pp. v-vii.
- Stokols, D.** 1996. Translating social ecological theory into guidelines for community health promotion. *American Journal of Health Promotion* 10(4):282-298.
- Stoop, W. A.** 1988. NARS linkages in technology generation and technology transfer. Working Paper no. 11. Wageningen: ISNAR.
- Storer, C. E., P. S. Thunder and R. Murray-Prior.** 2001. Information sources preferred by farmers using price risk tools.  
<<http://www.regional.org/ai/apem/2001/r/StorerC.htm?print=1>> 13 January 2010.
- Stringfellow, R., J. Coulter, T. Lucey, C. McKone and A. Hussain.** 1997. Improving the access of smallholders to agricultural services in Sub-Saharan Africa: farmer cooperation and the role of donor community. ODI Natural Perspectives no. 20.
- Stroud, A. and J. Hagmann.** 2006. Shared experiences of an ASARECA Programme: key challenges for institutions to operationalise INRM from ecoregional and NARS perspectives. African Highlands Initiative Working Papers no. 5. Entebbe: ASARECA.
- Sturges, P. and R. Neill.** 2004. *The quiet struggle: information and libraries for the people of Africa*. Omnie Interactive.
- Styhre, A.** 2002a. Non-linear change in organizations: organization change management informed by complexity theory. *Leadership and Organization Development Journal* 23(6):343-351.
- Styhre, A.** 2002b. The knowledge-intensive company and the economy of sharing: rethinking utility and knowledge management. *Knowledge and Process Management* 9(4):228-236.
- Styhre, A.** 2003. Knowledge management beyond codification: knowing as practice/concept. *Journal of Knowledge Management* 7(5):32-40.
- Suda, C.** 2002. Disparities in the Kenyan labour market: implications for poverty reduction. *Nordic Journal of African Studies* 11(3):301-321.

- Suvedi, M., M. K. Lapinski and S. Campo.** 2000. Farmers' perspectives of Michigan State University extension: trends and lessons from 1996-1999. *Journal of Extension* 38(1) <<http://www.joe.org/joe/2000february/a4.php>> 1 February 2010.
- Sveiby, K. E.** 1994. Towards a knowledge perspective on organization. PhD. diss. Stockholm: University of Stockholm.
- Sveiby, K. E.** 1997. *The new organisational wealth: managing and measuring knowledge-based assets*. San Francisco: Berrett-Koehler Publishers.
- Sveiby, K. E.** 2001a. Frequently asked questions. Brisbane: Sveiby Knowledge Associates. <<http://www.sveiby.com.au/faq.html>> 20 August 2007.
- Sveiby, K. E.** 2001b. What is knowledge management? Brisbane: Sveiby Knowledge Associates. <<http://www.co-i-l.com/coil/knowledge-garden/kd/whatiskm.shtml>> 4 June 2008.
- Sveiby, K. E.** 2001c. Knowledge management – lessons learned from pioneers. <[http://www.providersedge.com/docs/km\\_articles/KM\\_Lessons\\_from\\_the\\_Pioneers.pdf](http://www.providersedge.com/docs/km_articles/KM_Lessons_from_the_Pioneers.pdf)> 4 June 2008.
- Sweeney, A. and S. Martin.** 2008. *An introduction to management science: quantitative approaches to decision making*. 12th ed. Mason: Thomson Learning, Inc.
- Swanson, B. E.** 2008. Redefining agricultural extension's role in achieving sustainable rural development.
- Swanson, B. E.** 2010. Changing extension paradigms within a rapidly changing global economy. *Rural Development News* 1:59-63. <[http://www.agridea-international.ch/fileadmin/10\\_International/PDF/RDN/RDN\\_2010/12\\_extension\\_paradigms.pdf](http://www.agridea-international.ch/fileadmin/10_International/PDF/RDN/RDN_2010/12_extension_paradigms.pdf)> 6 July 2010.
- Talja, S.** 1997. Constituting "information" and "user" as research objects: a theory of knowledge formations as an alternative to the information man-theory. In: Vakkari, T., R. Savolainen and B. Dervin. (eds). *Information seeking in context*. Proceedings of an International Conference on Research in Information Needs, Seeking and Use in Different Contexts. 14-16 August, 1996, Tampere, Finland. London: Taylor Graham. pp. 67-80.
- Talja, S., K. Touminen and R. Savolainen.** 2005. "Isms" in information science: constructivism, collectivism and constructionism. *Journal of Documentation* 6(1):79-101.
- Tashakkori, A. and C. Teddlie.** 1998. *Mixed methodology: combining the qualitative and quantitative approaches*. Thousand Oaks: Sage Publications.
- Tashakkori, A. and C. Teddlie.** 2003. *Handbook of mixed methods in social and behavioral research*. Thousand Oaks: Sage Publications.
- Tashakkori, A. and C. Teddlie.** 2008. Quality of inferences in mixed methods research: calling for an integrative framework. In: Bergman, M. M. (ed.) *Advances in mixed methods research*. Los Angeles: Sage Publications. pp. 101-119.
- Taylor, M.** 1982. *Community, anarchy and liberty*. Cambridge: Cambridge University Press.
- Tchawa, P., N. Jean-Baptiste and Y. Bonneau.** 2001. The career and influence of Barthélemy Kameni Kjambou in Cameroon. In: Reij, C. and A. Waters-Bayer. *Farmer innovation in Africa: a source of inspiration for agricultural development*. London: Earthscan. pp. 23-27.
- Technical Centre for Agriculture and Rural Cooperation (CTA).** 1996. *The role of information for rural development in ACP countries: review and perspectives: proceedings of an international seminar*. Wageningen: CTA.
- Teddlie, C. and A. Tashakkori.** 2003. Major issues and controversies in the use of mixed methods in the social and behavioural sciences. In: Tashakkori, A. and C. Teddlie. (eds). *Handbook of mixed methods in social and behavioral research*. Thousand Oaks: Sage Publications. pp. 3-50.
- Teddlie, C. and A. Tashakkori.** 2006. General typology of research designs featuring mixed methods. *Research in the Schools* 13(1):12-28.
- Teddlie, C. and A. Tashakkori.** 2009. *Foundations of mixed methods research: integrating quantitative and qualitative approaches in the social and behavioural sciences*. Thousand Oaks: Sage Publications.
- Temu, A., I. Mwanje and K. Mogotsi.** 2003. *Improving agriculture and natural resources education in Africa: a stitch in time*. Nairobi: ICRAF.



- Tengo, M. and K. Belfrage.** 2004. Local management practices for dealing with change and uncertainty: a cross-scale comparison of cases in Sweden and Tanzania. *Ecology and Society* 9(3). <<http://www.ecologyandsociety.org/vol9/iss3/art4/>> 15 March 2007.
- Terre-Blanche, M. and K. Durrheim.** 2006. Histories of the present: social science research in context. In: Terre Blanche, M., K. Durrheim and D. Painter. (eds). *Research in practice: applied methods for the social sciences*. 2nd revised ed. Cape Town: University of Cape Town Press. pp. 1-17.
- Terre-Blanche, M., K. Kelly and K. Durrheim.** 2006. Why qualitative research. In: Terre Blanche, M., K. Durrheim and D. Painter. (eds). *Research in practice: applied methods for the social sciences*. 2nd revised ed. Cape Town: University of Cape Town Press. pp. 271-284.
- Thakadu, O. T.** 1998. Indigenous wildlife management knowledge systems and their role in facilitating community-based wildlife management projects in Botswana. M. Sc thesis. Pietermaritzburg: University of Natal.
- Thomas, G.** 1997. What's the use of theory? *Harvard Educational Review* 67(1):75-104.
- Thomas, G.** 2005. Innovation, agricultural growth and poverty reduction. In: Juma, C. (ed.) *Going for growth: science, technology and innovation in Africa*. London: Smith Institute. pp. 73-86.
- Thomas, D. B., A. Eriksson, M. Grunder and J. K. Mburu.** (eds). 1997. Soil and water conservation manual for Kenya. RoK. Ministry of Agriculture, Livestock Development and marketing. Soil and Water Conservation Branch. Nairobi: RoK.
- Thompson, M.** 1998. FRIENDS in Greece: commercializing an agricultural information service. <<http://www.fao.org/sd/CDdirect/CDan0012.htm>> 24 September 2007.
- Thomson, J. S., R. B. Radhakrishna, A. N. Maretzki and L. O. Inciong.** 2006. Strengthening community engagement toward sustainable local food systems. *Journal of Extension*. 44(4) <<http://www.joe.org/joe/2006august/a2.php>> 24 January 2010.
- Thysen, I.** 2000. Agriculture in the information society. *Journal of Agricultural Engineering* 76:297-303.
- Tichá, I. and P. Moulis.** 2004. Decision-making support for Czech farmers. *Agricultural Economics Czech* 50(2):59-64.
- Tidline, T.** 2005. Dervin's Sense-Making. In: Fisher, K. E., S. Erdelez and L. E. F. McKechnie. (eds). *Theories of information behavior*. (ASIST Monograph). Medford, NJ: Information Today. pp. 113-117.
- Tijani, S. A. and I. Yano.** 2007. The direct farmer's market: a tool for rural female empowerment. *Direct Marketing: An International Journal* 1(4):195-210.
- Tire, M.** 2006. Evaluation of the information dissemination mechanisms for small scale subsistence farmers. M. Phil. thesis. Stellenbosch: University of Stellenbosch. <<http://ir.sun.ac.za/dspace/bitstream/10019/135/1/TireM.pdf>> 24 March 2007.
- Tiwana, A.** 2002. The knowledge management toolkit: orchestrating IT, strategy, and knowledge platforms. 2nd ed. Upper Saddle River, NJ: Prentice Hall.
- Torero, M. and J. Von Braun.** (eds). 2006. *Information and communication technologies for development and poverty reduction*. Washington: International Food Policy Research Institute (IPRI).
- Tradenet.biz.** 2007. Tradenet.biz. <[www.tradenet.biz](http://www.tradenet.biz)> 15 March 2007.
- Trauger, A.** 2001. Women farmers in Minnesota and the post productivist transition. *The Great Geographer* 8(2):53-66.
- Tripp, R. and S. Pal.** 2000. Information and agricultural input markets: peral millet seed in Rajasthan. *Journal of International Development* 12:133-144.
- Tsoukas, H.** 2002. Do we really understand tacit knowledge? Paper presented to Knowledge Economy and Society Seminar, LSE Department of Information Systems. 14 June 2002. Also published in Easterby-Smith, M. and M. A. Lyles. (eds). 2003. *Handbook of organizational learning and knowledge*. Oxford: Blackwell. pp. 410-427.
- Turban, E., D. Leidner, E. McLean and J. Wetherbe.** 2001. *Information technology for management: transforming business in the digital economy*. 3rd ed. New York: Wiley.
- Turnbull, D.** 1993. Local knowledge and comparative scientific traditions. *Knowledge and Policy* 6 (3/4):29-54.
- Umali, D. L. and L. Schwartz.** 1994. Public and private agricultural extension: beyond traditional frontiers. World Bank Discussion Papers 236. Washington: The World Bank.



- United Kingdom (UK). Department of Social Security.** 1999. Opportunity for all: tackling poverty and social exclusion. First annual report 1999. Hayes: Department of Social Security.
- United Nations (UN).** 2001. The United Nations common country assessment for Kenya. Nairobi: UN.
- United Nations (UN).** 2009. The Millennium Development Goals Report 2009. New York: UN.
- United Nations Development Programme (UNDP).** 2005. *Investing in development: a practical plan to achieve the Millennium Development Goals*. London: Earthscan.
- United Nations Development Programme (UNDP).** 2007 Millennium development goals: Goal 1: eradicate extreme poverty and hunger. <<http://www.undp.org/mdg/goal1.shtml>> 18 October 2007.
- United Nations Development Programme (UNDP).** 2009. Human development report 2009. Overcoming barriers: human mobility and development. New York: UNDP.
- United Nations Economic Commission for Africa (UNECA).** 2005a. Emerging issues in science and technology for Africa's development: science, technology and innovation for meeting key MDGs. Addis Ababa: UNECA.
- United Nations Economic Commission for Africa (UNECA).** 2005b. Economic report on Africa 2005: meeting challenges of unemployment and poverty in Africa. Addis Ababa: UNECA.
- United Nations Economic Commission for Africa (UNECA).** 2007. Economic report on Africa 2007: accelerating Africa's development through diversification. Addis Ababa: UNECA.
- United Nations Economic Commission for Africa (UNECA).** 2007. Enhancing knowledge sharing to support the poverty reduction process in Africa: the knowledge audit report. Addis Ababa: UNECA.
- United Nations Economic Commission for Africa (UNECA).** 2009. African women's report 2009. measuring gender inequality in Africa: experiences and lessons from the African gender and development index. Addis Ababa: UNECA.
- United Nations Economic Commission for Africa (UNECA) and African Union (AU).** 2009. Economic report on Africa 2009. Developing African agriculture through regional value chains. Addis Ababa: UNECA.
- United Nations Educational Scientific and Cultural Organization (UNESCO). Information for All Programme (IFAP).** 2007. Information for All Programme. Report 2006 / 2007. Paris: UNESCO. <<http://unesdoc.unesco.org/images/0015/001592/159223e.pdf>> 13 May 2010.
- United States Department of State. Bureau of African Affairs.** 2007. Background note: Kenya. <<http://www.state.gov/>> 14 October 2007.
- University of KwaZulu Natal (UKZN). School of Education, Training and Development.** 2003. *Understanding research: learning guide and reader*. 2nd ed. Pietermaritzburg: University of KwaZulu-Natal.
- University of KwaZulu Natal (UKZN).** 2007. Research policy V: research ethics. <<http://research.ukzn.ac.za/Policies.aspx>> 12 March 2008.
- University of Nairobi. Faculty of Agriculture.** 2009. Master of Science in agricultural information and communication management. <<http://www.uonbi.ac.ke/academics/degree-regulations/?id=392&page=&type=1765&name=Introduction>> 26 March 2010.
- Van Crowder, L., W. Lindley, W. Truelove, J. P. Iibuodo and R. Del Castello.** 1998. Knowledge and information for food security in Africa: from traditional media to the internet. Rome: FAO.
- Van Den Ban, A. W.** 1998. Supporting farmers, decision making processes by agricultural extension. *Journal of Extension Systems* 14:55-67.
- Van Den Berg, H. and J. Jiggins.** 2007. Investing in farmers-the impacts of farmer field schools in relation to integrated pest management. *World Development* 35(4):663-686.
- Van Kerkhoff, L. and L. Lebel.** 2006. Linking knowledge and action for sustainable development. *Annual Review of Environment and Resources* 31:445-477.
- Vikas Nath.** 2000. Heralding ICT enabled knowledge societies: way forward for the developing countries. <<http://sdnp.delhi.nic...ternetinfo/articles/herading.htm>> 28 May 2007.

- Von Braun, J., R. V. Hill and R. Pandya-Lorch.** 2009. The poorest and the hungry: a synthesis of analyses and actions. In: Von Braun, J., R. V. Hill and R. Pandya-Lorch. (eds). *The poorest and hungry: assessments, analyses and actions*. Washington: IFPRI. pp. 1-61.
- Von Krogh, G., K. Ichijo, and I. Nonaka.** 2000. *Enabling knowledge creation: how to unlock the mystery of tacit knowledge and release the power of innovation*. New York: Oxford University Press.
- Von Liebenstein, G.** 2000. Interfacing global and indigenous knowledge: towards an indigenous knowledge information system. Paper presented to the Sixth UNESCO-ACEID International Conference on Education. Information Technologies in Educational Innovation for Development: Interfacing Global and Indigenous Knowledge. Held 12-15 December 2000, The Imperial Queen's Park Hotel, Bangkok, Thailand.
- Vorley, B., A. Fearne and D. Ray.** (eds). 2007. *Regoverning markets: a place for small-scale producers in modern agrifood chains?* Hampshire: Gower Publishing Company.
- Waema, T. M.** 2005. A brief history of the development of an ICT policy in Kenya. In: Etta, F. E. and L. Elder. (eds). *At the crossroads: ICT policy making in East Africa*. Ottawa: IDRC. pp. 25-43.
- Wagenaar, T. C. and E. Babbie.** 2001. *Practicing social science research: guided activities to accompany the practice of social research*. 9th ed. Stamford: Wadsworth/Thomson Learning.
- Waring, T.** 2000. *Practical systems thinking*. London: International Thomson Publishing.
- Waring, T.** 2002. Gender reflexivity: a missing element from action research in information systems. *Electronic Journal of Business Research Methods* 1(1):50-59.
- Warren, D. M.** 1991. Using indigenous knowledge in agricultural development. World Bank Discussion Paper. Washington: The World Bank.
- Warren, D. M., G. W. Von Liebenstein and L. Slikkerveer.** 1993. Networking for indigenous knowledge. *Indigenous Knowledge and Development Monitor* 1(1):2-4.
- Warren, D. M., L. J. Slikkerveer and D. Brokensha.** (eds). 1995. *The cultural dimension of development: indigenous knowledge systems*. London: Intermediate Technology Publications.
- Wassenaar, D. R.** 2006. Ethical issues in social science research. In: Terre Blanche, M., K. Durrheim and D. Painter. (eds). *Research in practice: applied methods for the social sciences*. 2nd ed. Cape Town: University of Cape Town. pp. 60-79.
- Waters-Bayer, A. and L. Van Veldhuizen.** 2005. Promoting local innovation: enhancing IK dynamics and links with scientific knowledge. IK Notes no. 76 January. Washington: The World Bank.
- Webb, T. J. and J. Cary.** 2004. Australia: social capital and natural resource management – the Australian Landcare movement. In: Rivera, W. and G. Alex. (eds). *Extension Reform for Rural Development series Volume 4. Revitalisation within public sector services: case studies of international initiatives*. Agriculture and Rural Development Discussion Paper 11. Washington: The World Bank. pp. 5-10.
- Weinberg, S. L. and S. K. Abramowitz.** 2008. *Statistics using SPSS: an integrative approach*. 2nd ed. Cambridge: Cambridge University Press.
- Weiss, A., L. Van Crowder and M. Bernadi.** 2000. Communicating agrometeorological information to farming communities. *Agricultural and Forest Meteorology* 103:185-196.
- Welman, C., F. Kruger and B. Mitchell.** 2005. *Research methodology*. 3rd ed. Cape Town: Oxford University Press.
- Wenger, E.** 1998. Communities of practice. Learning as a social system. Systems Thinker <<http://www.co-i-l.com/coil/knowledge-garden/cop/lss.shtml>> 17 July 2007.
- Wenger, E.** 1999. *Communities of practice. Learning, meaning and identity*. Cambridge: Cambridge University Press.
- Wenger, E., R. McDermott and W. M. Snyder.** 2002. *A guide to managing knowledge: cultivating communities of practice*. Boston: Harvard Business School Press.
- Westerik, H. and K. Renckstorf.** 2009. The social embeddedness of media use: an introduction. In: Westerik, H. and M. de Gruyer. (eds). *The social embeddedness of media use: action theoretical contributions to the study of TV use in everyday life*. Berlin: Walter de Gruyter. pp. 1-7.
- Westerik, H., K. Renckstorf, F. Wester and J. Lammers.** 2009. The situational and time-varying context of routines in television viewing. In: Westerik, H. and M. de Gruyer. (eds). *The social embeddedness of media use: action theoretical contributions to the study of TV use in everyday life*. Berlin: Walter de Gruyter. pp. 25-52.

- Whyte, A.** 2000. *Assessing community telecentres: guidelines for researchers*. Ottawa: IDRC.
- Wiemer, H. J., W. K. Sitonik, E. Munanie, M. K. Mwaura, A. Chele, H. G. Muriuki, N. Mugambi and J. K. Mungai.** 1997. Assessment of information needs and options for information management. Nairobi: Ministry of Agriculture, Livestock Development and Marketing.
- Wiig, K. M.** 1999. Introducing knowledge management into the enterprise. In: Liebowitz, J. (ed.) *Knowledge management handbook*. Boca Raton: CRC Press. pp. 3-1-3-41.
- Wiig, K. M.** 2003. A knowledge model for situation handling. *Journal of Knowledge Management* 7(5):6-24.
- Wiig, K. M.** 2004. *People-focused knowledge management: how effective decision making leads to corporate success*. Amsterdam: Elsevier.
- Wikipedia.** 2010. Gross value added. <[http://en.wikipedia.org/wiki/Gross\\_value\\_added](http://en.wikipedia.org/wiki/Gross_value_added)> 21 May 2010.
- Wikgren, M.** 2005. Critical realism as a philosophy and social theory in information science. *Journal of Documentation* 61(1):11-22.
- Wild, V.** 2006. The importance of convergence in the ICT policy environment. APC Issue Papers. <<http://rights.apc.org/papers.shtml>> 27 April 2008.
- Williams, R.** 2006. Narratives of knowledge and intelligence . . . beyond the tacit and explicit. *Journal of Knowledge Management* 10(4):81-99.
- Williamson, K.** 2006. Research in constructivist frameworks using ethnographic techniques. *Library Trends* 55(1):83-101.
- Williamson, S., A. Little, A. Ali, M. Arif, M. Kimani, C. Meir and L. Oruko.** 2003. Aspects of cotton and vegetable farmers' pest management decision-making in India and Kenya. *International Journal of Pest Management* 49(3):187-198.
- Wilson, B.** 2001. *Soft systems methodology: conceptual model building and its contribution*. Chichester: John Wiley and Sons Ltd.
- Wilson, I. M. and S. Abeyasekera.** 2006. Writing research protocols: a statistical perspective. Reading: University of Reading.
- Wilson, R. S., N. Hooker, M. Tucker, J. LeJeune and D. Doohan.** 2009. Targetting the farmer decision making process: a pathway to increased adoption of integrated weed management. *Crop Protection* 28:758-764.
- Wilson, T. D.** 1981a. A case study in qualitative research. *Social Science Information Studies* 1:241-146.
- Wilson, T. D.** 1981b. On user studies and information needs. *Journal of Librarianship* 37(1):3-15. <<http://informationr.net/tdw/publ/papers/1981infoneeds.html>> 17 July 2007.
- Wilson, T. D.** 1986. Information needs in social services: an overview. In: Horobin, G. and S. Montgomery. (eds). *New information technology in management and practice*. London: Kogan. pp. 12-24. <<http://informationr.net/tdw/publ/papers/infoneeds85.html>> 27 January 2008.
- Wilson, T. D.** 1994. Information needs and uses: fifty years of progress? In: Vickery, B. (ed.) *Fifty years of information progress: a Journal of Documentation review*. London: Aslib. pp. 15-51. <<http://informationr.net/tdw/publ/papers/1994JDocRev.html>> 17 July 2007.
- Wilson, T. D.** 1997a. Information behaviour: an inter-diciplinary persepective. In: P. Vakkari, R. Savolainen and B. Dervin. (eds). *Information seeking in context. Proceedings of an international conference on research in information needs, seeking and use in different contexts 14-16 August, 1996, Tampere, Finland*. London: Taylor Graham. pp. 39-50.
- Wilson, T. D.** 1997b. Information behaviour: an interdisciplinary perspective. *Information Processing and Management* 33:551-572.
- Wilson, T. D.** 1999. Models in information behaviour research. *Journal of Documentation* 55(3):249-270.
- Wilson, T. D.** 2000. Human information behaviour. *Informing Science* 3(1):49-55.
- Wilson, T. D.** 2002a. 'Information science 'and research methods. This paper is to appear in Slovak, in *Knižnicná a informacná veda (Library and Information Science)*. Brataca: Comenius University, Department of Library and Information Science.
- Wilson, T. D.** 2002b. Alfred Schutz, phenomenology and research methodology for information behaviour research. Paper delivered at ISIC4 - Fourth International Conference on



- Information Seeking in Context, Universidade Lusitana, Lisbon, Portugal, September 11 to 13, 2002. <<http://informationr.net/tdw/publ/papers/schutz02.html>> 22 January 2008.
- Wilson, T. D.** 2002c. The nonsense of 'knowledge management'. *Information Research* 8(1) Paper no. 144. <<http://InformationR.net/ir/8-1/paper144.html>> 24 February 2008.
- Wilson, T. D.** 2003. Philosophical foundations and research relevance: issues for information research. *Journal of Information Science* 29(6):445-452.
- Wilson, T. D.** 2005. Evolution in information behaviour modelling: Wilson's model. In: Fisher, K. E., S. Erdelez and L. E. F. McKechnie. (eds). *Theories of information behavior*. (ASIST Monograph). Medford, NJ: Information Today. pp. 31-36.
- Wilson, T. D.** 2006a. Revisiting user studies and information needs. *Journal of Documentation* 62(6):680-684.
- Wilson, T. D.** 2006b. On user studies and information needs. *Journal of Documentation* 62(6):658-670.
- Wilson, T. D. and C. Walsh.** 1996. Information behaviour: an interdisciplinary perspective. Sheffield: University of Sheffield, Department of Information Studies.
- Wilson, T. D. and D. R. Streatfield.** 1982. Action research and users' needs. A paper delivered at the 4th International Research Forum in Information Science, Borås, Sweden, 1981. (Revised version).
- Winter, R.** 2002. Managers, spectators and citizens: where does 'theory' come from in action research? In: Day, C., J. Elliot, B. Somekh and R. Winter. (eds). *Theory and practice in action research: some international perspectives*. Wallingford: Symposium Books. pp. 13-26.
- Wirastuti, N. M. A. E. D., R. Luckin, R. E. Sheriffi, K. Walker, J. Underwood and L. Dunkley.** 2008. Development of a knowledge management system integrated with local communication channels and knowledge management initiatives for Kenyan rural farming communities. *Proceedings of the Fifth IEEE International Conference on Wireless, Mobile and Ubiquitous Technologies in Education*. 23-26 March 2008. pp. 135-142. <<http://ieeexplore.ieee.org/xpl/mostRecentIssue.jsp?punumber=4489771>> 5 May 2010.
- Wolcott, H. F.** 2009. *Writing up qualitative research*. 3rd ed. Los Angeles: Sage.
- Wong, K. Y. and E. Aspinwall.** 2004. Knowledge management implementation frameworks: a review. *Knowledge and Process Management* 11(2): 93-104.
- Woolcock, M.** 1998. Social capital and economic development: toward a theoretical synthesis and policy framework. *Theory and Society* 27(2):151-208.
- Woolcock, M.** 2001. The place of social capital in understanding social and economic outcomes. *Isuma: Canadian Journal of Policy Research* 2(1):11-17.
- Woolcock, M. and D. Narayan.** 2000. Social capital: implications for development theory, research and policy. *The World Bank Research Observer* 15(2):225-49.
- The World Bank.** 1975. Kenya: into the second decade. Report of a mission sent to Kenya by the World Bank. Baltimore: John Hopkins University Press.
- The World Bank.** 1998. *World Bank development report 1998/99: knowledge for development*. Summary 1998/99. Washington: The World Bank. <<http://www.worldbank.org/wdr/wdr98/>> 24 March 2007.
- The World Bank.** 1999. *Indigenous knowledge for development*. Washington: The World Bank. <<http://www.worldbank.org/afr/ik/ikrept.pdf>> 20 December 2009.
- The World Bank.** 2003. *Reaching the rural poor: a renewed strategy for rural development*. Washington: The World Bank.
- The World Bank.** 2004a. A more equitable, prosperous, and competitive Kenya: country assistance strategy 2004 – 2007. Nairobi: The World Bank.
- The World Bank.** 2004b. Kenya: country assistance strategy 2004-2007. Nairobi: The World Bank.
- The World Bank.** 2004c. Agriculture knowledge and information systems – AKIS. <<http://lnweb18.worldbank.org/ESSD/ardext.nsf/PrintFriendly/467971A95B22470185256D5D006EAD2F?OpenDocument>> 20 October 2007.
- The World Bank.** 2005. Armenia Agricultural Reform Support Project. Implementation completion report (PPFI-Q0570 TF-29133 IDA-30350 IDA-30351) on a credit in the amount of SDR 11.9 Million (US\$16.25 Million equivalent) to the Republic of Armenia for the Agricultural Reform Support Project. The World Bank Report no: 34316.

- The World Bank.** 2006a. Module 3: Investments in agricultural extension and information services. In: The World Bank. *Agriculture investment source book*. Washington: The World Bank. <[www.worldbank.org/agsourcebook](http://www.worldbank.org/agsourcebook)> 13 September 2007.
- The World Bank.** 2006b. Africa development indicators: 2006. Washington: The World Bank.
- The World Bank.** 2006c. World development report 2007: development and the next generation. Washington: The World Bank.
- The World Bank.** 2006d. 2006 information and communications for development: global trends and policies. Washington: The World Bank.
- The World Bank.** 2006e. Enhancing agricultural innovation: how to go beyond the strengthening of research systems. Economic and Sector Work. Washington: The World Bank.
- The World Bank.** 2007a. Agriculture knowledge and information systems - AKIS <<http://lnweb18.worldbank.org/ESSD/ardext.nsf/PrintFriendly/467971A95B22470185256D5D006EAD2F?Opendocument>> 18 July 2007.
- The World Bank.** 2007b. Cultivating knowledge and skills to grow African agriculture: a synthesis of an institutional, regional, and international review. Report number 40997 Afr. Washington: The World Bank.
- The World Bank.** 2007c. *World development report 2008: agriculture for development*. Washington: The World Bank.
- The World Bank.** 2009a. *Gender in agriculture sourcebook*. Agriculture and Rural Development Series. Washington: The World Bank.
- The World Bank.** 2009b. Indigenous Knowledge for Development Program. <<http://web.worldbank.org/WBSITE/EXTERNAL/COUNTRIES/AFRICAEXT/EXTINKNOWLEDGE/0,,menuPK:825562~pagePK:64168427~piPK:64168435~theSitePK:825547,00.html>> 26 January 2010.
- The World Bank.** 2010a. *World development report: development and climate change*. Washington: The World Bank.
- The World Bank.** 2010b. Defining civil society. <<http://web.worldbank.org/WBSITE/EXTERNAL/TOPICS/CSO/0,,contentMDK:20101499~menuPK:244752~pagePK:220503~piPK:220476~theSitePK:228717,00.html>> 10 May 2010.
- Worth, S. H.** 2002. Sustainable extension: not transformation, but renewal. In: AIAEE 2002 Proceedings of the 18th Annual Conference, Durban, South Africa. pp. 437-480.
- Worth, S. H.** 2006. Agreflection: a learning model for agricultural extension in South Africa. *Journal of Agricultural Education and Extension* 12(3):179-193.
- Woytek, R.** 1998. Indigenous knowledge for development: a framework for action. Washington: The World Bank. Africa Region, Knowledge and Learning Centre.
- Wright, D. B.** 2003. Making friends with your data: improving how statistics are conducted and reported. *British Journal of Educational Psychology* 73:123-136.
- Wright, M. C.** 2000. On intellectual craftsmanship. In: Wright, M. C. (ed.) *The sociological imagination*. Oxford: Oxford University Press. pp. 195-226.
- Yin, R. K.** 1989. *Case study research: design and methods*. Revised edition. Applied Social Research Methods Series Volume 5. London: Sage Publications.
- Zack, M. H.** 1999. Managing codified knowledge. *Sloan Management Review* 40(4):45-58.
- Zand, D. E.** 1972. Trust and managerial problem solving. *Administrative Science Quarterly* 17(2):229-239.
- Zervekh, J-A and J. C. Claborn.** 2006. *Nursing today: transition and trends*. 5th ed. Missouri: Elsevier, Inc.
- Zhao, Y., R. Zhang and K. K. Klein.** 2009. Perceived information needs and availability: results of a survey of small dairy farmers in Inner Mongolia. *Information Research* 14(3) paper 411. <<http://InformationR.net/ir/14-3/paper411.html>> 18 November 2009.
- Zhuge, R. and C. Tisdell.** 1999. Sustainability issues and socio-economic change in the Jingpo communities of China. *International Journal of Social Economics* 26(1/2/3):21-45.
- Zijp, W.** 1994. Improving the transfer and use of agricultural information: a guide to information technology. The World Bank Discussion Paper no. 247. Washington: The World Bank.

- Zimmerman, J. N.** 2008. Voices from the past, lessons for the future: learning from the history of sociology in government. *Equal Opportunities International* 27(2):132-147.
- Zipf, G.** 1949. *Human behaviour and the principle of least effort: an introduction to human ecology*. Cambridge: Addison-Wesley.
- Zuidema, L.** 1988. Managing research-extension linkages. ISNAR staff notes. Wageningen: ISNAR.

## APPENDICES

### Appendix 1: Summary of objectives, research questions and data collection methods

Objective	Research question	Source of data	Rationale
	Understanding socio-economic status of groups.	<ul style="list-style-type: none"> <li>- Key informant interviews.</li> <li>- Secondary information.</li> </ul>	<ul style="list-style-type: none"> <li>- To collect socio-economic data.</li> </ul>
	<p>Understanding land use zones and changes over time.</p> <p>- Understanding on historical perspectives on changes over time.</p> <p>- Introducing the research to stakeholders and obtaining their feedback.</p>	<ul style="list-style-type: none"> <li>- Observation.</li> <li>- Secondary information.</li> <li>- Timelines.</li> <li>- Meetings.</li> </ul>	<p>- A preliminary visit was made in the four divisions to observe the different land use zones to help understand the main farming systems, features, resources, problems and opportunities of small-scale farmers and provide a cross-sectional overview of the area.</p> <p>- To explore temporal dimensions from a historic perspective and capture the chronology of events as recalled by local people. This provided a general picture of major events regarding AKIS and tapped into the knowledge of the elderly people. This process provided understanding on changes in the AKIS and current issues, and helped to develop rapport with the local community. The timelines were carried out on farmer groups.</p> <p>- Meetings were held with key stakeholders to introduce the research to the community. Meetings were held with informants to answer questions and obtain feedback.</p> <p>These methods helped to establish changes that have occurred in Kirinyaga district in terms of agricultural technology, farming practices, accessing and sharing knowledge and information. The methods collected data on how the changes took place, when they took place and why they took place, which helped to clarify the manner in which farmers acquire new knowledge and information and how they get new ideas and innovate. The process provided an insight into the kind of information and knowledge that farmers assimilate and shed light on farmers' local knowledge of traditional farming systems.</p>
1. Identify the information behaviour of	What are the information and knowledge needs of small-scale farmers?	<ul style="list-style-type: none"> <li>- Focus group discussions.</li> <li>- Individual interviews.</li> </ul>	To identify the information/ knowledge needs of farmers / farmer groups (by gender and type of groups).

small-scale farmers groups.	How do small-scale farmers go about seeking information and knowledge (men, women and the youth)?	- Focus group discussions. - Key informant interviews.	To establish the information seeking behaviour of small-scale farmers / farmer groups (by gender).
	Which farmer groups are in place in Kirinyaga district? What are their characteristics and what roles do they play in facilitating the exchange and sharing of knowledge and information?	- Key informant interviews.	To find out the farmers' groups in the district and establish the roles they play in sharing and exchanging knowledge and information among small-scale farmers.
<b>2. Identify sources of local knowledge and external information.</b>	Where do farmers get their agricultural related information?	- Key informant interviews. - Individual interviews. - Knowledge network analysis - Information source (RAAKS B3a)  - Agriculture services map (PRA)	- To establish the key sources of agricultural knowledge and information (local and external sources), the types, content and formats.  - To identify the information sources that are most used by farmers and to indicate the value that actors place on information services, ranks the sources and shows how the information and knowledge is used. The process showed the frequently used and the most important sources as well as the impact of services offered to different target audiences and helped identify areas for improvement. -To map out services and opportunities on agricultural inputs (seed, fertilizers, pesticides, and technologies), credit, processing and marketing.
	Who uses the agricultural knowledge and information?	- Individual interviews. - Focus group discussions. - Knowledge network analysis - Information source (RAAKS B3a)	To establish the flows of information from providers to other actors / intermediaries. - see above
	What AKIS (relevant to small-scale farmers) are present in the district? What are the key features of the system(s)?	- RAAKS Basic configurations.	To provide overviews of the AKIS in the different divisions. These included a synthesis of the results of the semi-structured interviews, informant interviews, communication network septagrams, PRA methods and focus group discussions.
<b>3. Investigate the</b>	Who are the primary	- Linkage matrices	- To collect data on agricultural actors considered important in the locality



linkages and flows of knowledge and information between stakeholders and channels of communication.	stakeholders (researchers, extensionists, educators, non-governmental organizations, farmers and other stakeholders)?	(PRA)  - Actor analysis identification (RAAKS A2).	and on how they link to one another. - To collect data on actors who are involved in the AKIS and their respective roles.
	What linkages mechanisms exist between actors? What type of linkages exist between actors?	- Network diagram (PRA). Focus group discussions. Individual interviews.  - Venn diagram (PRA).  - Prime mover septagram (RAAKS A5/B6).  - Integration analysis (RAAKS B4).	- To assess the mechanisms and activities that link actors. To assess the level of importance of linkages between actors and small-scale-farmers. The network diagrams depicted the diversity of existing linkages, frequency of contact and quality of relationships. The fact that the method is not yet popular in PRA provided an opportunity to test the method.  - To identify local and external, formal and non formal institutions and groups and their relationships with each other. The Venn diagrams depicted the perceptions of the local community regarding the importance of institutions, degree of interaction and level of influence on each other and small-scale farmers, and provided insight into the <i>power</i> structure and <i>decision making</i> of farmers' groups in the community. - To assess the level of influence of agricultural actors on a day to day basis. Different septagrams were drawn to identify the different actors who influence the sub-industries under the varied enterprises. The septagrams helped to establish the actors exert the strongest influence and who could change the situation and why. - To establish the key contacts, why they contact each other and how intensive the linkages are.
	How does information and knowledge flow between the key stakeholders? (social ecology of groups)	- Knowledge network analysis - Communication network sheet (RAAKS B3b).  Communication network diagrams (RAAKS).  - Interviews with key informants / providers.	- To establish the activities linking up agricultural actors of the AKIS. This window helped to establish how close the information sources were the users, and the value the user attached to the information or knowledge provided.  - To establish the flow of knowledge and information among key stakeholders.
	What communication media do actors use (including	- Focus group discussions.	- To establish the communication channels used.

	farmers / farmers' groups – men, women, youth)?	- Individual interviews.	
	Are ICTs used to share and exchange information?	- Key informant interviews. - Individual interviews. - Focus group discussions.	- To establish whether ICTs are used to share and exchange information.
	What ICTs do actors (including farmers / farmers' groups) prefer to use and why?	- Focus group discussions. - Key informant interviews. - Individual interviews.	- To find out ICT preferences of small-scale farmers.
	How are the ICTs being applied?	- Key informant interviews. - Focus group discussions. - Individual interviews.	- To find out how ICTs have been applied by small-scale farmers / farmer groups.
4. Assess the usage of knowledge and information.	What type types of information and knowledge do farmers obtain?	- Semi-structured interviews. - Focus group discussions.	- To find out the types of knowledge and information that farmers used.
	Can farmers relate specific instances a major decision / innovation was made or problem was solved as a result of applying knowledge and information?	- Focus group discussions. - Individual interviews.	- To establish whether small-scale farmers use information for problem solving, decision making, understanding or innovation; frequency of use; ease with which users are able to get information.
	How do farmers make decisions that deal specifically with risk?	- Focus group discussions. - Individual interviews	- To establish the process of decision making under risk conditions.
	What knowledge / information helped make the decision(s) / solve the problem / innovate (probe for the process and the instances)?	- Individual interviews.	- To establish the type of knowledge and information that small-scale farmers use and identify the main types of information.
	Were farmers satisfied with the decision(s) / innovation /	- Individual interviews.	To assess the level of satisfaction with available knowledge and information resources.

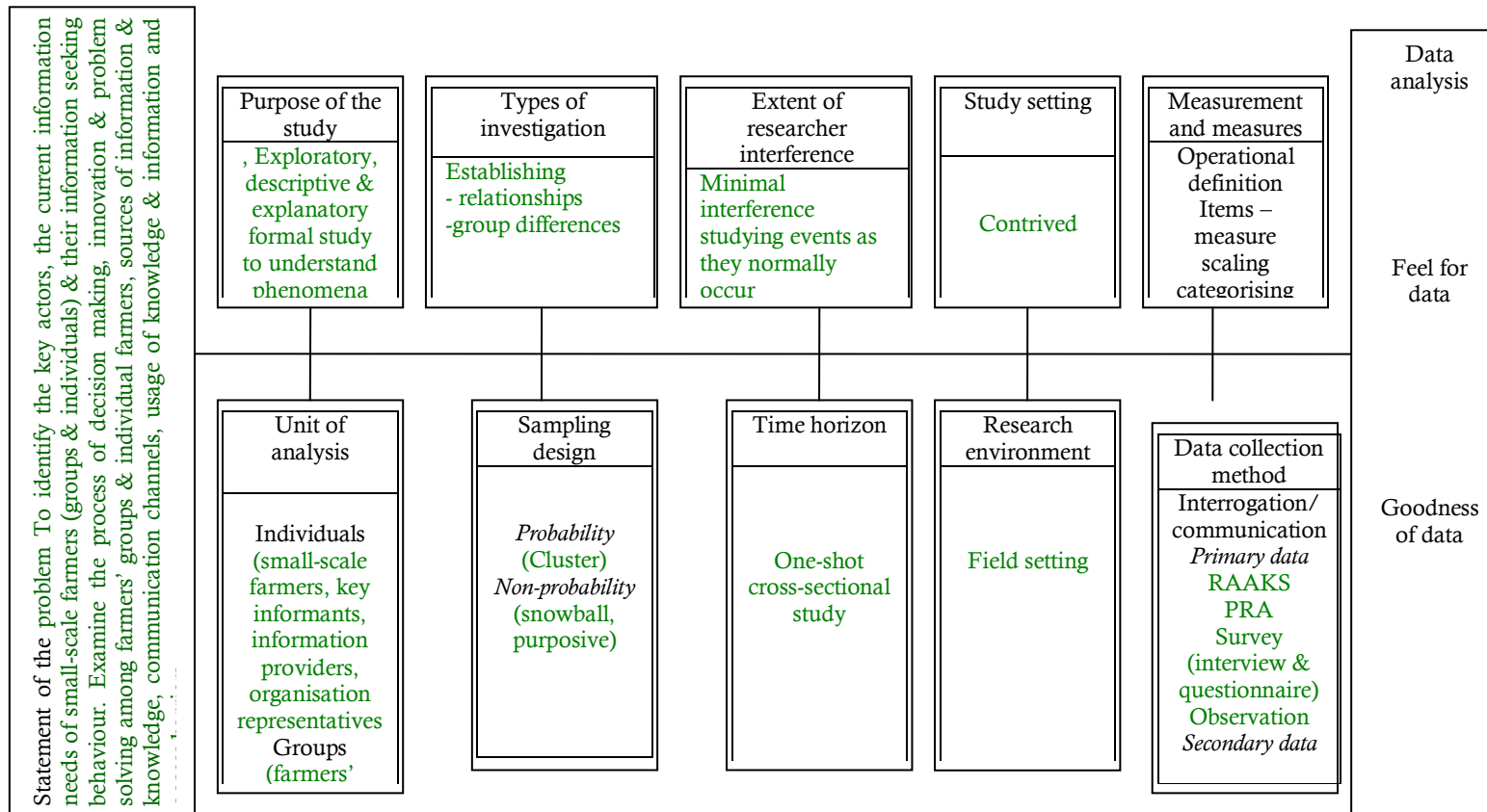
	solution? If so/not why?	- Focus group discussions.	
	What processes are involved in group decision making?	- Key informant interviews. - Focus group discussions. - Observation.	To establish the group decision making processes and power roles.
	How does individual farmer decision making differ from group decisions?	- Individual interviews.	To establish how individual decision making alters from group decision making.
	Is the knowledge and information available in the AKIS sufficient for addressing the needs of farmers? If not, how do farmers go about seeking external information?	- Basic configurations.  - Focus group discussions.	To establish sufficiency / insufficiency of knowledge and information and existing gaps.  To explore sufficiency / insufficiency of existing AKIS and discuss ways to improve on the AKIS.
5. Determine the current practices in managing local knowledge and external information among farmer groups.	What systems are in place for managing external information? What systems are in place for managing local knowledge?	- Individual interviews. - Focus group discussions.  - Knowledge network analysis (RAAKS B3A).  - Observation.	- To find out the knowledge and information management practices.  - To help identify the actors involved in managing knowledge and information and the knowledge management tasks they carry out. It helped identify the explicit and implicit aims of the knowledge management tasks, how the tasks influence interactions within the system and opportunities to improve the generation, exchange and utilisation and preservation of knowledge and information in the system.
6.0 Suggest an AKIS model for small-scale farmers in Kirinyaga district.		- Individual interviews. - Focus group discussions. - Basic configurations (RAAKS). - Service and opportunity map (PRA).	To model a flexible AKIS in line changes the small-scale farmers would like to see, taking into consideration their needs, existing sources of information and knowledge, major actors, communication channels and barriers to accessing agricultural knowledge and information. - To provide overviews of the AKIS in place and link this to the needs, wants and aspirations of local communities.

## Appendix 2: Paradigms – their ontology, epistemology and methodology

	<b>Ontology</b>	<b>Epistemology</b>	<b>Methodology</b>
<b>Positivist</b>	-Stable external reality -Law-like	-Objective -Detached observer	-Experimental -Quantitative -Hypothesis testing
<b>Postpositivism</b>	-Singular reality	-Distance and impartiality	-Deductive
<b>Interpretivism</b>	-Internal reality or subjective Reality	-Empathetic -Observer subjectivity	-Interactional -Interpretation -Qualitative
<b>Constructivism</b>	-Socially constructed reality -Discourse -Power -Multiple realities	-Closeness to participants -Suspicious -Political -Observer constructing versions	-Inductive -Deconstruction -Textual analysis -Discourse analysis
<b>Advocacy and participatory</b>	-Political reality -Negotiation with participants	-Collaboration	-Participatory
<b>Pragmatism / pluralistic</b>	-Singular and multiple realities	-Practicality	-Qualitative and Quantitative

Source: Terre-Blanche and Durrheim (2006:6) and Creswell and Plano Clark (2007:24-25).

### Appendix 3: Framework of the study research design



(adapted from Sekaran (2003:118) and Cooper and Schindler (2003:147))

#### Appendix 4: Letter of introduction from the University of KwaZulu-Natal



Information Studies Programme  
School of Sociology and Social Studies  
University of KwaZulu-Natal  
Private Bag X01  
Scottsville 3209  
Pietermaritzburg  
South Africa  
Tel: +27(0)332605007  
Fax: +27(0)332605092  
Email: [stilwell@ukzn.ac.za](mailto:stilwell@ukzn.ac.za)

11 June 2008

#### TO WHOM IT MAY CONCERN

#### REQUEST FOR CO-OPERATION AND ASSISTANCE WITH DOCTORAL RESEARCH PROJECT

Mrs Hilda Munyua (Student number 207521241) is a doctoral student on our Information Studies Programme. She is researching the topic

*Agricultural Knowledge and Information Systems (AKIS) among Small-scale Farmers in Kirinyaga District, Kenya.*

Her supervisor is Prof Christine Stilwell. I believe that this project has great potential benefit for your country and the region as a whole in terms of helping to improve AKIS and production in the sector in the longer term. Mrs Munyua is resident in Kenya during her studies with period of attendance at the University of KwaZulu-Natal. She will remain in Kenya after the completion of her studies to assist in the implementation of the recommendations of her study.

The project has met the requirements in terms of the Research and Ethical Clearance Policies of the University of KwaZulu-Natal.

Your cooperation and assistance will be greatly valued.

Yours faithfully

Christine Stilwell

Christine Stilwell  
Professor and Academic Coordinator

## Appendix 5: Letter of introduction from the researcher requesting consent

Dear .....,

### **Re: Informed Consent - Research on the Agricultural Knowledge and Information Systems (AKIS) among Small-scale Farmers in Kirinyaga District, Kenya**

Please allow me to introduce myself. My name is Hilda Munyua – a PhD candidate in the Information Studies Programme, University of KwaZulu-Natal, South Africa. As part of the requirements towards the fulfilment of my PhD programme, I am required to carry out research. I am carrying out my research on the agricultural knowledge and information systems among small-scale farmers in Kirinyaga district, Kenya.

The study focuses on small-scale farmers and farmer groups in the four divisions of Kirinyaga district as well as farmers not belonging to any group, information and knowledge providers, stockists and traders. The purpose of the study is to understand small-scale farmers as key actors in supporting agricultural development and linkages between key actors (especially farmer groups), their information behaviour, sources of information and knowledge, linkages and flows of knowledge and information (including the role of ICTs), usage of these resources and barriers to accessing knowledge and information. The study also aims to investigate the existing knowledge management and information management practices and to suggest an improved AKIS model. Kirinyaga district has diverse variations in farming systems and infrastructure conditions, which are likely to yield different small-scale farmers' AKISs with different needs and opportunities. Understanding this diversity could increase uptake of new improved technologies and improve agricultural production. The researcher will visit you at your site to facilitate the research process. Copies of the interview guide are available should you wish to review them in advance. The interview will take about two and a half hours.

I am writing to request you to participate in the study. Your name was selected as one of the small-scale farmers / farmer groups that are committed and are actively engaged in agricultural activities in Kirinyaga district. Participation would entail being interviewed, participating in discussions and participatory research methods. Please note that participation is purely voluntary and that you may withdraw at any time during the research process with no consequences whatsoever. Your participation will help improve the management of agricultural knowledge and information in the district.

Information provided during interviews will be treated in utmost confidence and only the researchers will have access to the information collected. Your name will not appear in the dissertation, publications or oral presentations made. Information collected and back-ups of electronic data will be securely stored and be used for research purposes only. After completion of the study, data and information collected will be filed and safely locked up in cabinets for five years, following which it will be disposed of through incineration.

Please do not hesitate to contact the researcher's supervisor or the researcher should you require any additional information or clarification regarding the research. Contact details are provided below.

Prof. Christine Stilwell (PhD), Information Studies Programme, School of Sociology and Social Studies, Information Studies Programme, University of KwaZulu-Natal, Private Bag X01, Scottsville Pietermaritzburg, South Africa, 3209. Email: <a href="mailto:stilwell@ukzn.ac.za">stilwell@ukzn.ac.za</a> Tel : +27(0)332605095/007	Mrs. Hilda Munyua Knowledge Trends Ltd P.O. Box 1110 Village Market Post code 00621 Nairobi Kenya Email : <a href="mailto:207521241@ukzn.ac.za">207521241@ukzn.ac.za</a> / <a href="mailto:munyua@iconnect.co.ke">munyua@iconnect.co.ke</a> Tel : +254733925148 or +254720297464
--	---

I look forward to your cooperation.

Yours sincerely  
Hilda Munyua  
(PhD candidate)



**Appendix 6: Letter of authorisation to carry out research from the Ministry of Education, Science and Technology introducing the researcher to the various institutions**



REPUBLIC OF KENYA

**MINISTRY OF HIGHER EDUCATION SCIENCE  
& TECHNOLOGY**

Telegrams: "SCIENCE TEC", Nairobi  
Telephone: 02-318581  
E-Mail: [ps@scienceandtechnology.go.ke](mailto:ps@scienceandtechnology.go.ke)

JOGOO HOUSE "B"  
HARAMBEE AVENUE,  
P.O. Box 9583-00200  
NAIROBI

When Replying please quote

Ref. MOHEST 13/001/ 38C 352/2

23<sup>rd</sup> June 2008

Hilda Matema Munyua  
University of Kwazulu  
P.O. Box 43844  
SOUTH AFRICA

**RE: RESEARCH AUTHORIZATION**

Following your application for authority to carry out research on,  
*'Agricultural Knowledge and Information Systems (AKIS) among  
Small Scale Farmers in Kirinyaga District, Kenya,*

I am pleased to inform you that you have been authorized to carry out  
research in Kirinyaga District for a period ending 30<sup>th</sup> October, 2009.

You are advised to report to the District Commissioner and the District  
Education Officer Kirinyaga District before embarking on your research.

On completion of your research, you are expected to submit two copies of  
your research report to this office.

  
**M. O. ONDIEKI**  
**FOR: PERMANENT SECRETARY**

Copy to:

The District Commissioner  
Kirinyaga District

The District Education Officer  
Kirinyaga District



## Appendix 7: Research permit from the Ministry of Education, Science and Technology

PAGE 1

THIS IS TO CERTIFY THAT:

Prof./Dr./Mr./Mrs./Ms. HILDA  
MANTEMA

of (Address) UNIVERSITY OF KWAZULU  
SOUTH AFRICA

has been permitted to conduct research in

Location, KIRINYAGA District,  
CENTRAL Province,

on the topic AGRICULTURAL KNOWLEDGE  
AND INFORMATION SYSTEMS (AKIS)  
AMONG SMALL SCALE FARMERS IN  
KIRINYAGA DISTRICT KENYA

for a period ending 30TH OCTOBER 2009


PAGE 2

MOEST 13/001/SBC 552

Research Permit No. \_\_\_\_\_

Date of issue 23.6.2008

Fee received KSH. 500



**PERMIT SECRETARY**  
**MINISTRY OF EDUCATION AND TECHNOLOGY**

M.O. ONDIEKI

Applicant's **FOR PERMANENT SECRETARY**  
**MINISTRY OF EDUCATION AND TECHNOLOGY**

## Appendix 8: Profile on pre-test respondents

Draft interview guide for farmers groups	Mama Lucia Karongari, Mama Mary Kamau and Mama Joyce Nyambura (representing a women's farmers' group - Kiringiro women's group) and Mugo Munyua, Muiruri and Ngoci (representing a youth group - Juja Tumaini self help group) ( <i>Juja</i> )
Draft interview guide for farmers belonging to a farmers' group	Mrs Mary Kiranga (farmer, Juja)
Draft interview guide for farmers not belonging to a farmers' group	Mr Peter Kimani Gitau (farmer, Juja)
Draft checklist for government ministries	Ms Jacinta Njogu (retired extensionist, Ministry of Agriculture)
Draft interview guide for NGOs, CBOs	Ms Esther Lung'ahi (Knowledge worker with the Arid Lands Information Network) that provides agricultural information and knowledge to rural communities in the East African region (Ethiopia, Kenya, Tanzania and Uganda) (Nairobi)
Draft interview guide for key informant	Prof. E. N. Ngugi (Chairperson of various groups, proprietor of school, farmer, community worker and model farmer) (Juja)
Draft interview guide for stockists and traders	Dr. C. Bwanga (Proprietor of Wambu Agrovet) (Kikuyu division)
Draft questionnaire for information providers	Mrs Jane Ileri (AfriAfya and AMREF) and Mrs G. Kamau (ILRI Information Centre) (Nairobi)
Draft observation checklist	Observations made in Juja by Sophie Onyari and researcher

## Appendix 9: Questionnaire for information providers

### A General

Date: \_\_\_\_\_ Code: \_\_\_\_\_

Name: \_\_\_\_\_ Position: \_\_\_\_\_ 1. Gender: Male ☐ Female ☐

2. Age bracket: 15-25 ☐ 26-35 ☐ 36-45 ☐ 46-50 ☐

51-60 ☐ 61-70 ☐ 71-80 ☐ > 80 ☐

3. Position of respondent: \_\_\_\_\_ 4. Name of institution: \_\_\_\_\_

5. Division: \_\_\_\_\_ 6. Location: \_\_\_\_\_

7. Sub-location: \_\_\_\_\_

### B Sources of local and / or indigenous agricultural<sup>82</sup> knowledge and external information

8. a. Does your organisation generate new agricultural technologies or recommend improved farming methods (seeds, crop varieties, pest control methods, equipment, tools, use of fertilizer, manure, compost, processing)?

Yes ☐ No ☐

b. If yes, who helps to develop the new technology or improve the farming methods?

9. What are the main agricultural information resources available at your organisation (e.g. books, videos, databases, audio tapes, newsletters, leaflets, posters)? \_\_\_\_\_

10. What information do these resources contain? Agricultural: Technical ☐ Market ☐ Production

☐ Processing ☐ Publicity ☐ Health ☐ Education ☐

Environment ☐ Government ☐ Other (specify) ☐

### C Training

11. a. Does your organisation conduct training for farmers? Yes ☐ No ☐

b. If yes, what type of training do you carry out? \_\_\_\_\_

12a. Do farmers share agricultural information obtained through training with other members of the community? Yes ☐ No ☐ If no, go to question 13.

b. How do farmers share the agricultural knowledge and information obtained through training with other members of the community? \_\_\_\_\_

### D Linkages and Channels of communication

13. How does your organisation share and exchange agricultural knowledge and information with other actors? (Tick all that apply)

How agricultural knowledge and information is shared	Tick
Through question and answer service	
Through listenership groups	
Through training	
Through extension services	
Through research activities	
Through visits to farmers fields	
Through study tours / shows / field days / exchange visits (specify)	
Through demonstrations	
Through farmers groups	
Through farmer field schools	
Through other community groups (religious, women, youth <sup>83</sup> , friendship- specify)	
Through other institutions (schools, NGOs, CBOs, government departments)	
Through traders	
Through stockists	
Through local authorities	

<sup>82</sup> Indigenous knowledge is the unique knowledge existing within people's memories and developed around specific conditions of women and men indigenous to a particular geographic area. Local knowledge is a blend of knowledge generated locally through practice and experience, and incorporating knowledge from several cultures within individual societies that may not be indigenous to the community in an ecosystem. The people have settled and resided together for many years and have developed local knowledge in an effort to cope with the ever-changing agri-ecological conditions.

<sup>83</sup> Youth - classified as young men and women aged between 15 and 25 years.

Through databases	
Through radio programmes	
Through television programmes	
Through e-mail	
Through discussion groups	
Through chat sessions	
Through websites and other internet resources	
Through blogs	
Hand-held devices(e.g. handheld personal computers, personal digital assistants)	
Through knowledge fairs	
Through films	
Print materials (free) (please specify)	
Print materials (for purchase) (please specify)	
Through meetings (e.g. <i>barazas</i> , local authority meeting)	
Through seminars	
Through community networks (specify)	
Through resource centre / library / knowledge centre	
Others (specify)	

14. a. What ICTs<sup>84</sup> does your organisation prefer to use (list in order of priority)? \_\_\_\_\_  
b. Why does your organisation prefer these ICTs? \_\_\_\_\_
15. a. What ICTs do small-scale farmers prefer to use to access agricultural knowledge and information (list in order of priority)? \_\_\_\_\_  
b. Why do the farmers prefer these ICTs? \_\_\_\_\_

#### **E Usage of agricultural knowledge and information**

16. a. Do users in the community use the agricultural knowledge and information resources provided by organisation? Yes ☐ No ☐  
b. If no, why don't community members use the information and knowledge? \_\_\_\_\_  
c. If yes, who are the primary users of the information and knowledge resources? \_\_\_\_\_  
d. What information resources do users mostly use? \_\_\_\_\_  
e. Why do the users prefer this / these resources? \_\_\_\_\_
17. a. Do you charge for information services (information and knowledge, telecommunication, training)? Yes ☐ No ☐ Both ☐  
b. How do community members view the fees you charge for information services? \_\_\_\_\_

#### **F Knowledge management and information management**

18. a. Does your organisation collect, process, organise, store and disseminate agricultural information? Yes ☐ No ☐  
b. If yes, how is the information collected? \_\_\_\_\_  
c. How is the information processed? \_\_\_\_\_  
d. How is the information organised and stored? \_\_\_\_\_  
e. How is the information retrieved? \_\_\_\_\_  
f. How is the information disseminated? \_\_\_\_\_  
g. How is the information used? \_\_\_\_\_
19. What are the key barriers and / or constraints your organisation encounters in collecting, processing, storing, retrieving and disseminating information? \_\_\_\_\_
20. a. Does your organisation repackage agricultural information? Yes ☐ No ☐  
b. If yes, what content do you repackage? \_\_\_\_\_  
c. Who is the primary audience for this content (e.g. farmers, researchers, extensionists, students, - probe if the organisation develops content specifically for farmers)?  
d. In what medium or format is the content (tick all that apply and specify medium)?  
Print ☐ Electronic ☐ Other ☐

<sup>84</sup> ICTs = Information and Communication Technologies (e.g. internet, cellular phones, SMS, digital cameras, databases, computer, radio, TV, video, cinema)

- e. What medium or format(s) do users prefer (list format / medium in order of priority)? \_\_\_\_\_
- f. Why do users prefer this / these format(s)? \_\_\_\_\_
21. In what language(s) are the available resources? Kiswahili ☐ English ☐ Other (specify) ☐
22. a. Do you collaborate with other actors in the community in repackaging content for farmers?  
Yes ☐ No ☐
- b. If yes, who do you collaborate with? / If no, why don't you collaborate with other actors?  
\_\_\_\_\_
- c. How do you go about repackaging agricultural information (probe for the steps taken, who is involved, what their contribution is)? \_\_\_\_\_
- d. What are the main difficulties you encounter with repackaging? \_\_\_\_\_
- e. How could repackaging of information for farmers be improved? \_\_\_\_\_
23. a. Does your organisation use local and / or indigenous agricultural knowledge in meeting your objectives?  
Yes ☐ No ☐
- b. If yes, how is the indigenous and / or local knowledge captured? \_\_\_\_\_
- c. How is the local and / or indigenous knowledge documented? \_\_\_\_\_
- d. How is the local and / or indigenous knowledge stored? \_\_\_\_\_
- e. How is the local and / or indigenous knowledge shared? \_\_\_\_\_
- f. What are the key barriers and / or constraints encountered in capturing and sharing local and / or indigenous knowledge? \_\_\_\_\_

### G Improved AKIS model

24. Suggest ways through which access and sharing of agricultural information and knowledge from different actors, institutions and farmers could be improved. \_\_\_\_\_
25. Is there anything you want to add or comment on? \_\_\_\_\_

Contact address

Postal address	
Telephone / Fax	
E-mail	

## Appendix 10: Interview guide for focus group discussions with farmers' group

### A. General

- Date / Tarehe: \_\_\_\_\_ Code / Kodi: \_\_\_\_\_
1. Names of respondents and gender / Majina ya wanaohojiwa na jinsia: \_\_\_\_\_
2. Type of group: Male only ☐ Female only ☐ Youth only ☐ Mixed<sup>85</sup> ☐
2. Aina ya kikundi: Waume pekee Wake pekee Vijana pekee Mchanganyiko  
(if mixed, please specify combination) \_\_\_\_\_
3. Division / Kata: \_\_\_\_\_ 4. Location / Tarafa: \_\_\_\_\_
5. Sub-location: \_\_\_\_\_ 6. Farmers' group name: \_\_\_\_\_
5. Kijiji 6. Jina la kikundi cha wakulima
7. Group status: Cooperative ☐ Association ☐ Farmers group ☐
7. Hali ya kikundi: Ushirika Jumua Kikundi cha wakulima  
Other (specify) / Nyingine ☐ \_\_\_\_\_
8. Registration: Registered ☐ Not registered ☐
8. Kuandikisha katika kitabu cha orodha: kimeandikishwa Hakijaandikishwa

### B Farmers' group / Kikundi cha wakulima

9. What are the main objectives of your farmers' group? \_\_\_\_\_
9. Kikundi chenu cha wakulima kina malengo gani?
10. When was your farmers' group established? \_\_\_\_\_
10. Kikundi chenu kiliundwa lini?
11. a. How was the group formed (probe for what led to the formation of the group)?
11. a. Kikundi kiliundwa vipi (dadisi nini ili wafanya waanzishe kikundi chao)? \_\_\_\_\_

<sup>85</sup> Farmers groups may be women only, men only, youth only or may be a mixture (men, women and youth or men and women, or women and youth or men and youth). If mixed, please specify combination.

- b. What is the group's membership (size, composition by gender and age range for example 18 years for the youngest to 80 years for the oldest)? \_\_\_\_\_
- b. Kikundi kina wanakikundi wangapi (Idadi ya wanachama au wanakikundi, mchanganyiko wa wahusika (wake, waume na vijana) na umri wa kati ya miaka mingapi, kwa mfano 18 hadi 80)? \_\_\_\_\_
- c. What are the requirements for membership (probe membership fee, education level, gender)? \_\_\_\_\_
- c. Masharti ya kujiunga na kikundi ni yapi (uliza ada, kiwango cha elimu, jinsia)? \_\_\_\_\_
- d. How is the group organised (structure, rules, funding)? \_\_\_\_\_
- d. Kikundi kimeundwaje (muundo, utaratibu (sheria za kikundi), mapato au mpangilio wa fedha)? \_\_\_\_\_
- e. Does culture play any role in the organisation and structuring of your farmers' group (probe whether men, women and the youth play different roles in the community)? \_\_\_\_\_
- e. Je mila au utamaduni huchangia kwenye mipangilio ya kikundi chenu cha wakulima (dadisi kama wanaume, wanawake na vijana wanatarajiwa kufanya kazi tofauti kwenye jamii)? \_\_\_\_\_
- f. Does gender play any role in the organisation and structuring of your farmers' group? \_\_\_\_\_
- f. Hali ya jinsia inachangia vipi kwenye mipangilio ya kikundi chenu cha wakulima? \_\_\_\_\_
12. a. Who are the leaders of the group (probe for gender balance and roles given to men, women and youth in mixed groups)? \_\_\_\_\_
12. a. Nani viongozi wa kikundi (dadisi kuhusu jinsia, au majukumu waliyopewa wanakikundi wa kiume, wa kike na vijana)? \_\_\_\_\_
- b. What are the responsibilities of the group leaders? \_\_\_\_\_
- b. Viongozi wa kikundi wana majukumu gani? \_\_\_\_\_
- c. What are the responsibilities of group members? \_\_\_\_\_
- c. Wanakikundi wana majukumu gani? \_\_\_\_\_
13. a. What activities are undertaken by the group (probe for farming activities, capacity building, priority setting)? \_\_\_\_\_
13. a. Kikundi chenu kina jishughulisha na nini (dadisi shughuli za ukulima, kujiendeleza kimasomo, kipaumbele cha majukumu)? \_\_\_\_\_
- b. Where does the group meet? \_\_\_\_\_
- b. Wanakikundi hukutana wapi wakati wa mikutano? \_\_\_\_\_
- c. When does the group meet (Probe for frequency of meetings)? \_\_\_\_\_
- c. Kikundi chenu hukutana lini (dadisi wanakutana mara ngapi)? \_\_\_\_\_
- d. What is discussed at the group meetings? \_\_\_\_\_
- d. Nini kinacho jadiliwa kwenye mikutano ya kikundi? \_\_\_\_\_
14. a. Who makes decisions in the group? \_\_\_\_\_
14. a. Nani anayetoa maamuzi kwenye kikundi? \_\_\_\_\_
- b. How are the decisions made shared among members of the group? \_\_\_\_\_
- b. Maamuzi yakishafanywa yanasambazwa vipi kwa wanakikundi? \_\_\_\_\_
15. a. How does your group market the produce of members (coffee, tea, horticulture, other crops and animals, fuelwood, poles, fodder) (specify)? \_\_\_\_\_
15. a. Mazao ya wanakikundi yanauzwaje (kahawa, majani chai, kilimo cha mboga mbali mbali, mifugo, kuni, vikingi)? \_\_\_\_\_
- b. Where do farmers market their produce? \_\_\_\_\_
- b. Wakulima huuza wapi mazao yao? \_\_\_\_\_
- c. How does your group find out the market information (probe for group's main markets and market prices - cooperative, farmers' group, <sup>86</sup>NAFIS, <sup>87</sup>KACE, Foodnet<sup>88</sup>, local and foreign markets, neighbours)? \_\_\_\_\_
- c. Kikundi hupataje habari kuhusu bei za bithaa? (dadisi kuhusu masoko muhimu na bei za bidhaa - chama cha ushirika, kikundi cha wakulima, NAFIS, KACE, Foodnet, masoko ya nyumbani na ya ng'ambo, majirani)? \_\_\_\_\_
- 16a. What are the main agricultural enterprises of your group (probe for horticulture, tea, coffee, dairy, maize, bananas)? \_\_\_\_\_
- 16a. Kikundi chenu kina miradi gani ya uzalishaji (dadisi kilimo cha mboga mbali mbali, majani chai, kahawa, ng'ombe wa maziwa, mahindi, ndizi)? \_\_\_\_\_
- b. What other enterprises or products do farmers produce individually? \_\_\_\_\_

<sup>86</sup> NAFIS = National Farmers Information Service

<sup>87</sup> KACE = Kenya Agricultural Commodity Exchange

<sup>88</sup> Foodnet = A market information network providing information to farmers and traders in the Eastern Africa region

b. Wakulima binafsi hukuza au kuzalisha mazao gain mengine kwenye mashamba mwao?

17. Could you list the agricultural enterprises in the categories provided and give an overall ranking in order of priority (with one as most important)?

17. Munaweza kuorodhesha miradi hiyo ya uzalishaji kulingana na umuhimu (nambari moja ikiwa muhimu zaidi)?

No.	Enterprise / <i>Mradi</i>	Cash / <i>Kilimo cha mapato</i>	Subsistence / <i>Kilimo cha matumizi</i>	Other / <i>Nyingine</i>
1				
2				
3				
4				
5				

18. Why do you rank the agricultural enterprises in this order of priority (probe for criteria considered for ranking)?

18. Kwanini mumeorodhesha hivi miradi hiyo ya uzalishaji (dadisi vigezo vilivyotumika)?

No.	Criteria considered for ranking / Utaratibu uliotumika kuorodhesha mazao
1	
2	
3	
4	
5	

19. a. Looking back on any major decisions the group has made about these agricultural enterprises, give one instance when the group has made a major decision and describe what happened (probe for what situation they were in).

19. a. Mukitafakari maamunuzi mulioyopitisha kuhusu miradi muhimu ya uzalishaji, munaweza kusimulia mfano mmoja ambapo kikundi kilifanya uamuzi muhimu na kueleza ilivyoendelea (dadisi kikundi kilikua katika hali gani wakati huo)?

b. What were your questions at the time of making the decision/s? \_\_\_\_\_

b. Ulijiuliza maswali gani kwa wakati ulipokua ukifanya maamuzi?

c. How did you get the answers (what resources did you use)? \_\_\_\_\_

c. Mulipata majibu kwa njia gani (mulitumia njezo gani)?

d. What was this decision? \_\_\_\_\_

d. Mulifanya uamuzi gani?

e. What feelings does the group have in connection with this decision? \_\_\_\_\_

e. Kikundi chenu kina hisia gani kuhusu uamuzi huo?

f. Did these feelings change the group? Yes / **Ndio** ☐ No / **La** ☐

If no, go to question 20.

f. Je hisia hizi zilibadili kikundi chenu?

g. How did these feelings relate to the group's farming activities? \_\_\_\_\_

g. Hisia au maoni hayo yalikusiana vipi na kilimo cha kikundi?

h. How did these feelings change the group? \_\_\_\_\_

h. Hisia au maoni hayo yalibadili vipi kikundi chenu?

i. What difficulties did your group experience in arriving at the decision?

i. Mulipata matatizo gani kwenye kufanya uamuzi? \_\_\_\_\_

20. a. Looking back on any major decisions the group has made on agricultural enterprises, name ways in which these decisions have impacted on the group in relation to farming. \_\_\_\_\_

20. a. Mukitafakari maamuzi ya awali yaliyofanywa na kikundi chenu kuhusu miradi muhimu ya uzalishaji, taja njia ambazo maamuzi hayo yamebadilisha kikundi chenu kwenye mambo ya ukulima.

b. How did the choice of enterprise(s) help or hinder the group's farming related activities? \_\_\_\_\_

b. Chaguo la miradi ya uzalishaji lilisaidia au kuadhiri shughuli za kilimo za wanakikundi?

c. What were the outcomes of the choice of enterprise(s) (probe if the choice attracted widespread participation from farmers, increased understanding, improved communication, built trust among small-scale farmers, enhanced a sense of community, increased awareness of agricultural knowledge / marketing opportunities, increased adoption of new technologies / improved farming systems, contributed to change in farming practices, improved agricultural productivity)? \_\_\_\_\_

c. Kulikua na matokeo gain kuhusu chaguo la mradi (miradi) ya uzalishaji (dadisi kama ni kuvutia wakulima wengine ili kushirikishwa, uongezekaji wa ujuzi, kufahamu, kuoresha mawasiliano, kujenga kuaminiana kati ya wakulima wadogo, kuongeza hali ya mawasiliano, kueneza ujuzi / elimu



kuhusu mafunzo ya ukulima / upanuzi wa masoko, kuongezeka kwa mbinu mpya za teknolojia / kuchangia mabadiliko ya mbinu za kilimo, kuboresha uzalishaji wa kilimo)?

21. a. Is your farmers' group involved in decision making within your community?

Yes / **Ndio** ☐ No / **La** ☐ If no, go to question 22.

21. a. **Kikundi chenu huhusishwa kwenye maamuzi ya jamii au kijiji? Kama la, jibu swali no 22.**

b. How is your group involved? \_\_\_\_\_

b. **Kikundi chenu kinahusishwa kwa njia gani?**

c. To what extent is your group involved in decision making within your community?

c. **Kikundi chenu huhusishwa kwenye maamuzi ya jamii kwa kiwango gani?**

1= not involved at all                      2                      3                      4                      5=heavily involved

**hakihusishwi kamwe**

**Kinahusishwa sana**

d. How satisfied are you with the involvement of your group in community decision making?

d. **Kikundi chenu kimeridhishwa jinsi kinavyohusishwa kwenye maamuzi ya jamii kwa kiwango gani?**

1= not satisfied at all                      2                      3                      4                      5=highly satisfied

**hatukuridhika kamwe**

**tukuridhika kabisa**

### C. **Information behaviour / Mwenendo wa habari**

22. What agricultural information and knowledge does your group need for the agricultural enterprise ranked priority number 1? \_\_\_\_\_

22. **Kikundi chenu kinahitaji habari na ujuzi gani kuhusu mradi wa uzalishaji mlioupatia umuhimu nambari 1?**

23. How does the group go about seeking for information and knowledge for the enterprise ranked priority number 1? \_\_\_\_\_

23. **Kikundi chenu hutafuta vipi habari na ujuzi unaohusu mradi wa uzalishaji mlioupatia umuhimu nambari 1?**

24. Who collects the information for the group?

24. **Je ni nani anayetafuta habari na mafunzo ya kilimo kwa niaba ya kikundi chenu?**

25. In what way is this information shared with members (probe for flow of information, drama, barazas, meetings, demonstrations, training, radio, photographs, other ICTs)?

25. **Habari hizi husambazwa vipi kwa wanakikundi (dadisi kuhusu usambazaji wa habari, michezo ya kuigiza, baraza, mikutano, maonyesho, mafunzo ya kilimo, radio, picha na teknolojia nyingine za mawasiliano ya habari)?** \_\_\_\_\_

26. What information and knowledge does your group need for the agricultural enterprise(s) ranked priority number 2? \_\_\_\_\_

26. **Kikundi chenu kinahitaji habari na ujuzi gani wa kilimo kuhusu miradi ya uzalishaji mulioipatia umuhimu nambari 2?**

27. How does your group go about seeking for information and knowledge for the agricultural enterprise(s) ranked priority number 2? \_\_\_\_\_

27. **Kikundi chenu hutafuta vipi habari na ujuzi wa kilimo kuhusu miradi ya uzalishaji mulioipatia umuhimu nambari 2?**

28. In what way is this information shared with members (probe for flow of information, drama, barazas, meetings, demonstrations, training, radio, photographs, other ICTs)?

28. **Habari hizi za kilimo na ujuzi husambazwa vipi kwa wanakikundi (dadisi kuhusu usambazaji wa habari, michezo ya kuigiza, baraza, mikutano, maonyesho, mafunzo, radio, picha na teknolojia nyingine za mawasiliano ya habari)?** \_\_\_\_\_

29. a. Does the group share the information accessed with other members of the community?

29. a. **Kikundi chenu husambaza habari mulizozipata kwa wanakijiji wengine?**

Yes / **Ndio** ☐ No / **La** ☐ If no, move to question 33.

b. If yes, with whom does the group share the agriculture-related information that you access (Probe for whether members share information with other farmers in the community that do not belong to any farmers' group)? \_\_\_\_\_

b. **Kama Ndio, kikundi chenu kinasambazia nani hizo habari (dadisi kama kikundi hushirikisha wakulima wengine ambao sio wanakikundi)?**

c. How does the group share this information with the community?

c. **Kikundi chenu kinasambaza vipi habari za ukulima kijijini?** \_\_\_\_\_

d. Why does the group do that? \_\_\_\_\_

d. **Nikwanini kikundi chenu hufanya hivyo?**

e. What barriers or constraints does the group encounter in accessing and sharing of information?

e. **Ni vikwazo gani vinavyowakabili wakati kikundi chenu kinapotafuta au kusambaza habari?**

30. a. Does your group share indigenous and / or local agricultural knowledge assets possessed by the group (probe whether it is local and / or indigenous knowledge)?

30. a. Kikundi chenu husambaza ujuzi wa **kiasili** au wa **kinyumbani** kuhusu kilimo (dadisi kama ni ujuzi wa kiasili au wa kinyumbani)?

Yes / Ndio ☐ No / La ☐ If no, go to question 31.

b. If yes, with whom does the group share the local and / or indigenous agricultural knowledge with (Probe for whether members share local and / or indigenous knowledge with other farmers in the community that do not belong to any farmers' group)?

b. Kama ndio, kikundi chenu husambaza elimu au ujuzi wa asili kwa kina nani (dadisi kama kikundi hushirikisha / husambaza ujuzi wa asili na / au kinyumbani kuhusu kilimo kwa wakulima wengine ambao sio wanakikundi)?

c. If no, state why not? \_\_\_\_\_

c. Kama hapana, elezeni ni kwa nini?

d. How do you share the local and / or indigenous agricultural knowledge?

d. Munasambaza vipi ujuzi wa asili na / au kinyumbani kuhusu kilimo? \_\_\_\_\_

e. Why do you share the local and / or indigenous agricultural knowledge? \_\_\_\_\_

e. Kwanini kikundi chenu kinasambaza ujuzi huo wa kiasili na / au wa kinyumbani?

f. What barriers or constraints does the group encounter in accessing and sharing agricultural knowledge? \_\_\_\_\_

f. Ni vikwazo gani vinavyowakabili wakati munapotafuta au kusambaza habari na ujuzi wa kiasili kuhusu kilimo?

g. How does your group overcome the barriers or constraints?

g. Kikundi chenu huepuka vipi vikwazo hivyo? \_\_\_\_\_

31. a. Does your group need any particular kinds of information or advice or training on any agricultural activities that you would like to introduce / improve but do not have enough information about? Yes / Ndio ☐ No / La ☐ If no, go to question 32.

31. a. Kikundi chenu kinahitaji habari, au mafunzo, au ushauri kuhusu kilimo bora kama vile teknolojia mpya lakini hamuna habari au mafunzo ya kutosha kuhusu mbinu hizo mpya?

b. If yes, what are the reasons for the group not having enough information and knowledge?

b. Kama ndio, nini sababu ya upungufu huo wa habari na ujuzi?

c. What information, advice or training does your group need?

c. Ni habari gani au mafunzo gani munayohitaji? \_\_\_\_\_

d. Why does the group need this information and knowledge? \_\_\_\_\_

d. Kwanini munahitaji habari hizi na ujuzi huu wa kilimo?

e. Has your group tried to get this information, advice or training?

e. Kikundi chenu kimeshajaribu kupata hizi habari, au mafunzo, au mawaidha?

Yes / Ndio ☐ No / La ☐ If no, go to question 32.

f. If yes, what happened (probe from who, what was their response, who was trained, what was the outcome)? If not, why has the group not tried to get it? \_\_\_\_\_

f. Kama ndio, kulitendeka nini (dadisi kuhusu kutoka kwa nani, majibu yao yalikuwa yapi, ni nani walipata mafunzo, kulikua na matokeo gani)? Kama la, kwanini kikundi hakikujaribu kupata usaidizi?

#### **D. Sources of local and / or indigenous agricultural knowledge and external information**

##### **D. Chanzo cha ujuzi wa asili na / au kinyumbani na wa habari za kilimo kutoka nje**

32. How does your group find out news of a new technology, variety, breed, farming system or how to control agricultural pests and diseases, market? \_\_\_\_\_

32. Kikundi chenu hupata vipi taarifa kuhusu mbinu mpya za kiteknolojia, uzao, mbegu, mbinu mbalimbali za kilimo au jinsi ya kuzuia wadudu waharibifu na magonjwa, au soko?

33. a. Where does your group go for information or advice when members have a farming question (probe for village leaders, extension workers, rural experts, research centre, training and education institution, neighbours, books, radio, rural research centre / library)?

33. a. Wanakikundi wenu hupata wapi habari za kilimo, au mafunzo, au mawaidha wanapokua na maswali ya kilimo? (dadisi kuhusu viongozi wa kijiji, ofisa ugani (waendelezi wa kilimo), mabingwa wa kijiji vituo vya utafiti, vituo vya mafunzo, vituo vya elimu, majirani, vitabu, redio, maktaba)?

b. Do you have a rural resource centre / library within your community?

b. Muna maktaba au kituo cha habari kijijini kwenu?

Yes / Ndio ☐ No / La ☐ If no, go to question 34.

c. If yes, what kind of information does your group access from the centre (probe for agricultural, trade and marketing, health, education, government information (specify))? \_\_\_\_\_



- c. Kama ndio, kikundi chenu hapata habari gani kutoka kituoni humo au maktaba hiyo (dadisi kuhusu kilimo, soko na biashara, afya, elimu, habari za serikali (specify))?
34. a. Looking back on any incident where the group required advice or an answer to a farming question - did the group pay for the advice or was it free?
34. a. Mukitafakari wakati wowote ambapo kikundi chenu kilikua kinahitaji usaidizi au mawaidha kuhusu swali la kilimo, je mulihitajika kulipa ada yoyote au huduma ilikua bure?
- Paid for advice / Tulilipa Ada ☐ Advice was free / Huduma ilikua bure ☐
- b. How did the group value this information (probe for the feelings the group had towards this service or information)? \_\_\_\_\_
- b. Kikundi chenu kilithamini vipi habari hizo za kilimo (dadisi kuhusu hisia wanakikundi waliokua nayo kuhusu huduma hiyo au habari hizo)?
- c. How did the fee-based advice / free advice relate to the farming question?
- c. Ulipaji wa ada au kutolipa ada kulichangia vipi swali hilo la kilimo?
- d. What was the outcome on the group's farming activities? \_\_\_\_\_
- d. Habari zilizohitaji ada au mulizopata bure zilikuwa na matokeo gani kuhusu shughuli za kilimo?
35. a. What are your main sources for advice and information on farming? \_\_\_\_\_
35. a. Vyanzo muhimu vya kupata habari za kilimo na ushauri ni vipi?
- b. What makes you consider these the main sources? \_\_\_\_\_
- b. Kwa nini munazipa umuhimu hizi njia?
36. a. What are the group's main sources for information and knowledge for the agricultural enterprise ranked priority number 1 (probe for local and / or indigenous and external sources).
36. a. Vyanzo muhimu vya habari na ujuzi kuhusu mradi wa uzalishaji mlioupatia umuhimu nambari 1 ni vipi (dadisi kuhusu chanzo cha kiasili au habari na pia zinazotoka nje).
- b. What information does the group get from each of the sources mentioned above for agricultural enterprise ranked priority number 1?
- b. Kikundi chenu hupata habari gani kutoka kila chanzo cha habari inayohusu mradi wa uzalishaji mlioupatia umuhimu nambari 1 hapo juu?
- c. How frequently does your group obtain information from the key sources for agricultural enterprise ranked priority number 1? (probe for periodicity - weekly, monthly, bi-monthly, three times a year, twice a year)?
- c. Kikundi chenu hupata habari au ujuzi kutoka kwenye vyanzo muhimu vinavyohusu mradi no. 1 mara ngapi? (dadisi kama ni kila wiki, kila mwezi, mara tatu kwa mwaka, mara mbili kwa mwaka)?
- a. Source (enterprise 1) b. Type of information c. Frequency
- /Chanzo cha mradi no. 1/ Aina ya habari / mara ngapi
37. a. How easy or difficult is it for the group to access the main sources for agricultural enterprise ranked priority number 1? (Likert 1-5 1=very easy, 5=very difficult)
37. a. Ni rahisi au vigumu vipi kwa kikundi chenu kupata habari kutoka vyanzo muhimu vya mradi wa uzalishaji mlioupatia umuhimu nambari 1. (1=rahisi sana, 5=vigumu sana)
- Source / Chanzo: (rahisi sana) (vigumu sana)
- |         |              |   |   |   |                  |
|---------|--------------|---|---|---|------------------|
| 1 _____ | 1= very easy | 2 | 3 | 4 | 5=very difficult |
| 2 _____ | 1= very easy | 2 | 3 | 4 | 5=very difficult |
| 3 _____ | 1= very easy | 2 | 3 | 4 | 5=very difficult |
| 4 _____ | 1= very easy | 2 | 3 | 4 | 5=very difficult |
- b. How reliable is the information or advice you get for each of the sources of agricultural enterprise ranked priority number 1 (Likert 1-5 1=very reliable 5=not reliable)?
- b. Habari au ushauri munaopata kutoka vyanzo mbali mbali vya mradi wa uzalishaji mlioupatia umuhimu nambari 1 ni wa kuaminika kiwango gani? (Likert 1-5 1=kinaaminika kabisa 5=hakiaminiki kamwe)?
- Source / Chanzo: (Kinaaminika kabisa) (hakiaminiki kamwe)
- |         |                  |   |   |   |                 |
|---------|------------------|---|---|---|-----------------|
| 1 _____ | 1= very reliable | 2 | 3 | 4 | 5=not reliable  |
| 2 _____ | 1= very reliable | 2 | 3 | 4 | 5= not reliable |
| 3 _____ | 1= very reliable | 2 | 3 | 4 | 5= not reliable |
| 4 _____ | 1= very reliable | 2 | 3 | 4 | 5= not reliable |
- c. How useful is the information or advice your group gets for each of the sources of agricultural enterprise ranked priority number 1 (Likert 1-5 1=very useful 5=not useful)?
- c. Habari hizi au ushauri huu munaopata kutoka vyanzo mbali mbali kuhusu mradi wa uzalishaji mlioupatia umuhimu nambari 1 zina manufaa kiasi gani (Likert 1-5 1=very useful 5=not useful)?
- Source / Chanzo: (kinaleta manufaa sana) (hakileti manufaa kamwe)
- |         |                |   |   |   |               |
|---------|----------------|---|---|---|---------------|
| 1 _____ | 1= very useful | 2 | 3 | 4 | 5=not useful  |
| 2 _____ | 1= very useful | 2 | 3 | 4 | 5= not useful |

3 \_\_\_\_\_ 1= very useful 2 3 4 5= not useful  
 4 \_\_\_\_\_ 1= very useful 2 3 4 5= not useful

d. To what extent is the information available from these sources relevant to your needs for agricultural enterprise ranked priority number 1?

d. Habari za kilimo munazopata toka vyanzo hivi vinafungamana vipi na mahitaji yenu kuhusu mradi wa uzalishaji mulioipatia umuhimu nambari 1?

Source / Chanzo: (hazifungamani kamwe) (zinafungamana kabisa)

1 \_\_\_\_\_ 1= not relevant at all 2 3 4 5=very relevant  
 2 \_\_\_\_\_ 1= not relevant at all 2 3 4 5=very relevant  
 3 \_\_\_\_\_ 1= not relevant at all 2 3 4 5=very relevant  
 4 \_\_\_\_\_ 1= not relevant at all 2 3 4 5=very relevant

38. a. What are your group's main sources of information and knowledge for the agricultural enterprise ranked priority number 2 (probe for local and / or indigenous and external sources)?

38. a. Vyanzo muhimu vya kikundi chenu munakopata habari na ujuzi kuhusu mradi wa uzalishaji mulioipatia umuhimu nambari 2 ni ipi (dadisi kuhusu chanzo cha asili na / au za kinyumbani na za kutoka nje ya kijiji) ?

b. What information does your group get from the sources mentioned above for agricultural enterprise ranked priority number 2?

b. Kikundi chenu hupata habari gani kutoka kwenye vyanzo mbali mbali kuhusu mradi wa uzalishaji mulioipatia umuhimu nambari 2?

c. How frequently does your group get information or knowledge from the main sources of agricultural enterprise ranked priority number 2? (probe whether weekly, monthly, bi-monthly, three times a year, twice a year, once a year, other access)

c. Kikundi chenu hupata habari au ujuzi kutoka vyanzo muhimu vya mradi wa uzalishaji mulioipatia umuhimu nambari 2 mara ngapi? (dadisi kama ni kila wiki, kila mwezi, mara tatu kwa mwaka, mara mbili kwa mwaka, mara moja kwa mwaka)?

a. Source (enterprise) b. Type of information / c. Frequency /  
 Chanzo (mradi) 2 Aina ya habari Mara ngapi

39. What information do you get for agricultural enterprises ranked priority number 1, 2, 3, 4, and 5 from your farmers' group? \_\_\_\_\_

39. Kikundi chenu cha wakulima hupata habari gani kuhusu miradi ya uzalishaji mulioipatia umuhimu nambari 1, 2, 3, 4, na 5?

### E Linkages and channels of communication / Viunganishi na njia za mawasiliano

40. a. What linkages does your farmers' group have with other associations, networks or stakeholders you work with (probe for linkages with any they have not mentioned, establish what they do and how the farmers groups benefit from them such as KENFAP<sup>89</sup>, KESSFA<sup>90</sup>, KNFU<sup>91</sup> and national and international organisations)?

40. a. Kikundi chenu kina uhusiano gani na vyama vingine au mitandao au washikadau au jumuiya au mitandao mingine (dadisi kuhusu jinsi kikundi cha wakulima kinajumuika na washikadau wengine kama vile KENFAP, KESSFA, KNFU au mashirika ya jumuiya na ya kimataifa)?

b. What major barriers or constraints do you experience with these stakeholders?

b. Kikundi chenu hupata vizuizi au matatizo gani na washikadau hawa? \_\_\_\_\_

c. How have you attempted to bridge the barriers or constraints mentioned above?

c. Mumejaribu vipi kusuluhisha matatizo ya kikundi? \_\_\_\_\_

d. What was the outcome? \_\_\_\_\_

d. Mulikua na matokeo gani?

e. If you had the power, what would you change to improve linkages with other actors?

e. Kama mungelikuwa na uwezo, mungefanya mabadiliko gani ili kuboresha uunganishi wa washikadau wengine? \_\_\_\_\_

41. a. I am going to mention a list of some communication methods used for capturing and sharing local and / or indigenous agricultural knowledge. Please indicate which ones your group has had used (for accessing or sharing local and / or indigenous agricultural knowledge and information)? (probe for others not on list)

41. a. Nitataja orodha ya njia za upelekaji wa habari zinazotumika kukamata na kusambaza ujuzi wa kilimo ya kitamaduni au wa kiasili. Elezeni ni mbinu au njia zipi kikundi chenu kimewahi kutumia (dadisi kuhusu nyingine ambazo hazikutajwa) (kupata na kusambaza habari za kilimo na ujuzi wa kiasili au wa kinyumbani) munazotumia mara kwa mara (dadisi kuhusu njia nyingine za upelekaji wa habari)?

<sup>89</sup> KENFAP = Kenya National Federation of Agricultural Producers

<sup>90</sup> KESSFA = Kenya Small-scale Farmers' Association

<sup>91</sup> KNFU = Kenya National Farmers' Union

Communication methods used to capture and share local or indigenous knowledge / njia za upelekaji wa habari ninazotumika kukamata na kusambaza ujuzi wa kilimo wa kiasili au wa kinyumbani.	Tick as applies	Communication methods used to capture and share local or indigenous knowledge / njia za upelekaji wa habari ninazotumika kukamata na kusambaza ujuzi wa kilimo wa kiasili au wa kinyumbani.	Tick as applies
Drama / michezo ya kuigiza		Radio / redio	
Stories / hadithi		WorldSpace radio	
Song / nyimbo		Television / televisheni	
Artifacts / vinyago		Video	
Meetings or barazas / mikutano au baraza		Telephone (land line) / simu ya ardhi	
Exchange visits / ziara za kubadilishana		Cellular phone / simu ya mkono	
Study tours / safari ya kutazama na kujifunza		Internet / mtandao wa intanet	
Demonstration / maonyesho ya kuonyesha matendo		PDA <sup>92</sup> / compyuta ndogo ya mkononi	
Shows / shoo		Others (specify) / nyingine	
Word of mouth passed on from elders and earlier generations / mawaidha na ujuzi iliotokana na wazee wa kale uliopitishwa kwa mdomo			
Neighbours / majirani			
Print (specify) / chapa (fafanua)			

b. How effective have each of the main communication methods your group has used in accessing and / or sharing agricultural knowledge and information? (probe level of effectiveness not effective at all =1 very effective =5)

b. Kwa kila njia muhimu ya upelekaji wa habari ambao kikundi chenu kimetumia kupata au kusambazia habari au ujuzi wa kilimo, elezea kimewafaa kwa kiwango gani?

(not effective at all / hakikutufaa kamwe =1 / very effective / kilitufaa kikamilifu kabisa =5)

Njia / chombo cha mawasiliano

Communication methods (hakikutufaa kikamilifu kamwe) kilitufaa kikamilifu kabisa

1 _____	1= not effective at all	2	3	4	5=very effective
2 _____	1= not effective at all	2	3	4	5=very effective
3 _____	1= not effective at all	2	3	4	5=very effective
4 _____	1= not effective at all	2	3	4	5=very effective
5 _____	1= not effective at all	2	3	4	5=very effective

c. How much experience does your group have with these methods? (very little =1 very much =5).

c. Kikundi chenu kina ujuzi wa kiasi gani kuhusu matumizi ya njia hizi au vyombo hivi vya mawasiliano? (very little / kidogo sana =1 very much / ujuzi mwingi sana=5)?

Communication methods

Njia za upelekaji wa habari

	Kidogo sana				mwingi sana
1 _____	1= very little	2	3	4	5=highly experienced
2 _____	1= very little	2	3	4	5=highly experienced
3 _____	1= very little	2	3	4	5=highly experienced
4 _____	1= very little	2	3	4	5=highly experienced
5 _____	1= very little	2	3	4	5=highly experienced

42. a. Now I want you to go back to the ICTs that your group has experience with in accessing and sharing local and / or indigenous agricultural knowledge and select three that your group prefers to use. What are these? \_\_\_\_\_

42. a. Sasa nataka mutafakari teknolojia za mawasiliano ya habari ambazo kikundi chenu kimetumia kupata au kusambazia habari za ukulima na ujuzi au elimu ya kienyeji au ya kitamaduni. Kikundi chenu kinapendelea teknolojia au mbinu gani za mawasiliano ya habari?

b. Why do you prefer these ICTs? \_\_\_\_\_

b. Ni kwa nini munapendelea hizi teknolojia za mawasiliano ya habari?

c. How has the group applied these ICTs? \_\_\_\_\_

<sup>92</sup> Personal digital assistant (PDA) is a small, light, robust digital device. It is a handheld device are used to collect and disseminate agricultural information, to capture farmers questions and send them to the central processing centre and to deliver information in response to farmers questions in the field. PDAs are also used for geographical information system applications and for communication.

- c. Kikundi chenu kimetumia vipi teknolojia hizo za mawasiliano ya habari?  
d. What is good about these ICTs (probe for what led the group to adopt the ICTs)?  
d. Ni nini kizuri kuhusu teknolojia hizi za mawasiliano ya habari (dadisi kuhusu nini ilivutia kikundi kuzitumia)? \_\_\_\_\_  
e. How helpful is each ICT to your group? (Not at all =1 very helpful =5)  
e. Teknolojia hizi za mawasiliano ya habari zilisaidia kikundi chenu kwa kiwango gani?  
(Not at all / haikusaidia kamwe =1 very helpful / ilisaidia sana =5)  
ICT / Teknolojia za mawasiliano ya habari  
1 \_\_\_\_\_ 1= not at all 2 3 4 5=very helpful  
2 \_\_\_\_\_ 1= not at all 2 3 4 5=very helpful  
3 \_\_\_\_\_ 1= not at all 2 3 4 5=very helpful  
f. What barriers or constraints does your group experience with each of these ICTs?  
f. Munakabilianaje na viziuzi au vikwazo gani kwenye kikundi chenu na teknolojia hizi za mawasiliano ya habari?  
ICT / teknolojia ya mawasiliano ya habari Barriers / constraint / vikwazo au viziuzi

43. Looking back over your group's uses of ICTs, name any ways in which they have changed your group in relation to agriculture in your community. \_\_\_\_\_

43. Mukitafakari teknolojia za mawasiliano ya habari ambazo kikundi chenu kimewahi kutumia, eleza zimeleta matokeo gani au mabadiliko gani kuhusu kilimo kijijini kwenu.

#### **F Usage of knowledge and information / Matumizi ya ujuzi na habari**

44. a. Describe a specific instance(s) when your group made a major decision / innovation / solved a problem / helped understanding as a result of using some item of agricultural knowledge and information (mention the steps the group took). \_\_\_\_\_

44. a. Simulia au arifia wakati ambao kikundi chenu kilifanya uamuzi muhimu / ugunduzi au uvumbuzi / utatuzi wa shida / kuzidisha ufahamu baada ya kutumia habari za kilimo au ujuzi / elimu ya kilimo (fafanua kulitokea nini kipindi hicho na ni hatua gani mulichukua).

b. What knowledge and / or information helped your group to make the decision / innovation / solve a problem / understanding? \_\_\_\_\_

b. Ni habari / ujuzi gani ulisaidia kikundi chenu kufanya uamuzi / uvumbuzi au ugunduzi / kutatua shida / kuzidisha ufahamu?

c. Were you satisfied with the decision / innovation / solved a problem / innovation / problem solving you made/ understanding? Yes / Ndio ☐ No / La ☐

c. Je muliridhika na uamuzi muliufanya / ugunduzi au uvumbuzi / utatuzi wa shida / uzidishaji wa ufahamu?

d. Why do you say so? \_\_\_\_\_

d. Kwanini muna maoni hayo?

e. What difficulties did you have arriving at the decision / innovation / solution / understanding?

e. Mulipata shida gani kufanya uamuzi / uvumbuzi / au kupata suluhisho / kuelewa? \_\_\_\_\_

#### **G Knowledge management and information management / Usimamizi wa ujuzi na usimamizi wa habari**

45. a. How does your group capture important agricultural related knowledge (probe for medicinal plants to control or treat animal diseases, preservation of maize, how the knowledge is captured – in people's heads, artefacts, tapes, video, photographs, role model, through demonstrations,)? \_\_\_\_\_

45. a. Kikundi chenu cha wakulima hunasa vipi habari za ujuzi (dadisi kuhusu ujuzi kama vile wa mitishamba ya kutibu au kuzuia magonjwa ya mifugo, kuhifadhi mahindi unavyonaswa – kwenye vichwa vya watu, vinyago, utepe, video, picha, mfano mwema, na maonyesho)?

b. Who keeps the knowledge that is captured? \_\_\_\_\_

b. Nani huweka ujuzi unaonaswa?

46. Describe a specific instance when your group captured, organised, recorded and stored knowledge (probe for steps taken in capturing, processing, recording and storing the knowledge. How was knowledge passed on from the elders - orally by word of mouth, observation and experimentation, writing, video, audio-tape, photographs, drama, knowledge base)?

46. Simulia tokeo halisi wakati kikundi chenu kilinasa, kutayarisha, kurekodi na kuweka ujuzi (dadisi kuhusu hatua mulizopitia kunasa, kurekodi na kutumia ujuzi kama vile kupokea ujuzi kutoka kwa wazee wa kale kupitia kwa usemi, kuangalia na kujaribi, maadishi, video, utepe, picha, michezo ya kuigiza, benki ya ujuzi)?

a. How did you capture and organise the knowledge? / Mulinasa na kutayarisha vipi ujuzi huo wa kilimo? \_\_\_\_\_

b. How did you record and store the knowledge? / Mulirekodi na kuweka vipi ujuzi huo? \_\_\_\_\_

- c. How did you share the knowledge? / **Mulisambaza vipi ujuzi huo?** \_\_\_\_\_
- d. Why did the group capture, organise, record and share the knowledge? \_\_\_\_\_
- d. **Kwanini kikundi chenu kilinasa, kutayarisha, kurekodi na kusambaza ujuzi huo wa kilimo?**
- e. How was the knowledge used? / **Ujuzi huo ulitumiwa vipi?** \_\_\_\_\_
47. Describe a specific instance when your group collected, processed and stored, and / or disseminated agricultural information (probe for steps taken by the group in all or the specific processes that were undertaken)? \_\_\_\_\_
47. **Simulia tokeo halisi ambapo kikundi chenu kilikusanya, kutayarisha, kuweka na kusambaza habari za kilimo (dadisi kuhusu hatua zilizochukuliwa na kikundi kusanya habari hizo, kuzitayarisha kwa matumizi na kuziweka, na kuzisambaza).**
- a. How did your group collect the information? \_\_\_\_\_
- a. **Kikundi chenu kilikusanya vipi habari za kilimo?**
- b. How did your group process the information? \_\_\_\_\_
- b. **Kikundi chenu kilitayarisha vipi habari hizo kwa matumizi?**
- c. How did your group store the information? \_\_\_\_\_
- c. **Kikundi chenu kiliweka vipi habari mulizotayarisha?**
- d. How did your group disseminate the information? \_\_\_\_\_
- d. **Kikundi chenu kilisambaza vipi habari hizo?**
- e. Why did your group acquire, process, store and disseminate the information? \_\_\_\_\_
- e. **Kwanini kikundi chenu kilitafuta, kutayarisha, kuweka na kusambaza habari hizo?**
- f. How was the information used? \_\_\_\_\_
- f. **Habari hizi zilitumiwa vipi?**
48. a. Does your group integrate the external agricultural information and local and / or indigenous knowledge? \_\_\_\_\_
48. a. **Kikundi chenu huchanganya habari za kilimo za nje na elimu au ujuzi wa kiasili?**
- Yes / **Ndio** ☐ No / **La** ☐ If no, go to question 49.
- b. If yes, narrate an example of how your group have combined the external information and local and / or indigenous knowledge you possess and explain the steps you took? \_\_\_\_\_
- b. **Kama ndio, je unaweza kutoa mfano mmoja jinsi kikundi chenu kimeweza kuchanganya habari za kilimo na elimu au ujuzi wa kilimo wa kiasili na / au wa kinyumbani na ueleze hatua mulizofwata?**
- c. Why do you combine the information? \_\_\_\_\_
- c. **Kwa nini munachanganya habari hizo na ujuzi wa kiasili?**
- d. How does the external information relate to your group's local and / or indigenous agricultural knowledge assets? \_\_\_\_\_
- d. **Habari hizi za kutoka nje zinahusiana vipi na mazingira au rasimali zenu za ujuzi wa kilimo?**
- e. How does the integrated information help the farming activities of your group members? \_\_\_\_\_
- e. **Habari hizi kutoka nje na za kiasili zinatangamana vipi na ujuzi wa kiasili kwenye shughuli za kilimo za wanakikundi?** \_\_\_\_\_

#### **H Improved AKIS model**

49. Suggest ways through which linkages could be strengthened, and how the sharing of agricultural knowledge and information could be improved in the community. \_\_\_\_\_
49. **Muna mashauri gani kuhusu uboreshaji wa viunganizi kati ya washikadau, na wa uboreshaji wa usambazaji wa habari za kilimo na ujuzi kijijini.**
50. Is there anything you want to add or comment on / **Kuna chochote ungependa kuongeza?** \_\_\_\_\_

### **Appendix 11: Interview guide for individual farmers belonging to a farmers' group**

#### **A. General**

- Date: \_\_\_\_\_ Code: \_\_\_\_\_
- Name: \_\_\_\_\_
1. Gender: Male ☐ Female ☐
1. **Jinsia** Mme Mke
2. Age / **Umri**
- |                                |                                |                                |                                |
|--------------------------------|--------------------------------|--------------------------------|--------------------------------|
| 15-25 <input type="checkbox"/> | 26-35 <input type="checkbox"/> | 36-45 <input type="checkbox"/> | 46-50 <input type="checkbox"/> |
| 51-60 <input type="checkbox"/> | 61-70 <input type="checkbox"/> | 71-80 <input type="checkbox"/> | > 80 <input type="checkbox"/>  |
3. Type of group: Male only ☐ Female only ☐ Youth ☐ Mixed ☐
3. **Aina ya kikundi: Waume pekee Wake pekee Vijana pekee Mchanganyiko**
4. Division / **Kata** \_\_\_\_\_
5. Location / **Tarafa:** \_\_\_\_\_
6. Sub-location: \_\_\_\_\_
7. Farmers' group name: \_\_\_\_\_
6. **Kijiji** \_\_\_\_\_
7. **Jina la kikundi cha wakulima** \_\_\_\_\_



8. Are you the head of your household? Yes ☐ No ☐  
 8. Wewe ndiwe mkuu wa nyumba? Ndio ☐ La ☐  
 9. Household type, education level and membership of other groups: (tick as appropriate)  
 9. Aina ya nyumba, kiwango cha elimu na uanachama kwa vikundi vingine: (Chagua vilivyo)

a.	Male headed / Nyumba inaongozwa na mme	Female headed / Nyumba inaongozwa na mke	Child headed / Nyumba inaongozwa na mtoto	Other / aina ingine
b. Education level b. Kiwango cha elimu None / Sikusoma Primary / Elimu ya msingi Secondary / Elimu ya upili College / Chuo cha kati University / Chuo kikuu				
c. Membership of other groups (list) c. Uanachama wa vikundi vingine				

**B Agricultural enterprise(s) / Miradi ya uzalishaji**

10. What are your main farming objectives? \_\_\_\_\_  
 10. Madhumuni ama malengo yako ya kilimo ni yapi?  
 11. What are the main agricultural enterprises of your household (horticulture, tea, coffee, dairy, maize, bananas)? \_\_\_\_\_  
 11. Ni ipi miradi muhimu zaidi ya uzalishaji kwenye nyumba yako (dadisi kama kilimo cha mboga mbali mbali, majani chai, kahawa, mahindi, ng'ombe wa maziwa, ndizi)?  
 12. What was it that led you to decide on these agricultural enterprises? \_\_\_\_\_  
 12. Nini ilikufanya uamue kuchagua miradi hii ya uzalishaji?  
 13. Could you list the enterprises in the categories provided and give an overall ranking (with one as most important)?  
 13. Unaweza kuorodhesha miradi hiyo ya uzalishaji kulingana na umuhimu kwenye makundi yafuatayo (nambari moja ikiwa muhimu zaidi)?

No. Nambari	Enterprise Mradi wa uzalishaji	Cash / Kilimo cha mapato	Subsistence / Kilimo cha matumizi	Other Mengine
1				
2				
3				
4				
5				

14. Why do you rank the agricultural enterprises in this order of priority (probe for criteria considered for ranking)?

14. Kwanini umeorodhesha hivi miradi hiyo ya uzalishaji (dadisi vigezo vilivyotumika)?

No. Nambari	Criteria considered for ranking Utaratibu uliotumika kuorodhesha miradi ya uzalishaji
1	
2	
3	
4	
5	

15. a. Looking back on any decisions you have made about these agricultural enterprises, what feelings or emotions have you had in connection with these decisions (probe for what the feelings were)?

15. a. Ukita fakari maamunuzi au uamuzi uliopitisha kuhusu miradi hii muhimu ya uzalishaji, una hisia gani au maoni gani kulingana na maamuzi au uamuzi uliofanya (dadisi kama alikua katika hali gani wakati huo)?

- b. What were your questions at the time of making the decision/s? \_\_\_\_\_

b. Ulijiuliza maswali gani kwa wakati ulipokua ukifanya maamuzi?

- c. Did these feelings change you? Yes / Ndio ☐ No / La ☐

If no, go to question 16.

c. Hisia hizo zilikubadilisha?

- d. If yes, how did the feeling change you? \_\_\_\_\_

- d. Kama ndio, je hisia hizo zilikubadilisha vipi?
16. a. Looking back on any decisions you have made about these agricultural enterprises, name any ways in which these decisions have impacted on your life in relation to farming. \_\_\_\_\_
16. a. Ukitafakari maamuzi au uamuzi wa hapo awali kuhusu miradi ya uzalishaji, taja njia ambazo maamuzi hayo yamebadilisha maisha yako kwenye mambo ya ukulima.
- b. What was happening in your life at the time that you decided on the agricultural enterprise(s)? \_\_\_\_\_
- b. Ulikua unajishugulisha na nini maishani mwako kabla ya kuanzisha miradi ya uzalishaji uliotaja?
- c. Was there anything that helped you arrive at this decision on the agricultural enterprise(s)? Yes / Ndio ☐ No / La ☐ If no, go to e.
- c. Kulikua na kitu chechote ambacho kilikusaidia kuamua juu ya mradi / miradi hiyo ya uzalishaji?
- d. If yes, what helped this situation? \_\_\_\_\_
- d. Kama ndio, nini ilisaidia kwa wakati huo?
- e. Did the choice of enterprise help you in terms of improving farming? Yes / Ndio ☐ No / La ☐ If no, go to g.
- e. Je chaguo la mradi lilikusaidia?
- f. If yes, what was helpful regarding the choice of enterprise in relation to farming? \_\_\_\_\_
- f. Kama ndio, uamuzi wa mradi au miradi ulikusaidia vipi shughuli zako za kilimo?
- g. Did the choice of enterprise hinder your farming activities? Yes / Ndio ☐ No / La ☐ If no, go to i.
- g. Je chaguo la mradi au miradi lilizuia shughuli zako za kilimo?
- h. If yes, what was hindering regarding the choice of enterprise in relation to farming? \_\_\_\_\_
- h. Kama ndio, uamuzi wa mradi au miradi ulizuia vipi shughuli zako za kilimo?
- i. What were the outcomes of the choice of enterprise(s)? \_\_\_\_\_
- i. Je chaguo la mradi / miradi lilileta matokeo gani?

**C. Information behaviour / Mwenendo wa habari**

17. What agricultural information and knowledge do you need for the enterprise ranked priority number 1? \_\_\_\_\_
17. Je unahitaji habari na ujuzi gani wa kilimo unaohusika na mradi uliopatia umuhimu nambari 1?
18. How do you go about seeking for information and knowledge for the enterprise ranked priority number 1? \_\_\_\_\_
18. Wewe hutafuta vipi habari hizo na ujuzi unaohusika na mradi uliopatia umuhimu nambari 1?
19. How does your farmers' group facilitate the exchange and sharing of knowledge and information needed for the enterprise ranked priority number 1? \_\_\_\_\_
19. Je kikundi chako cha wakulima husaidiaje usamabazaji na uenezaji wa habari na ujuzi unaohusika na mradi uliopatia umuhimu nambari 1?
20. What information and knowledge do you need for the enterprise ranked priority number 2? \_\_\_\_\_
20. Je unahitaji habari na ujuzi gani wa kilimo unaohusika na mradi uliopatia umuhimu nambari 2? \_\_\_\_\_
21. How do you go about seeking for information and knowledge for enterprise ranked priority number 2? \_\_\_\_\_
21. Wewe hutafuta vipi habari na ujuzi unaohusika na mradi uliopatia umuhimu nambari 2?
22. a. Did your farmers' group facilitate the exchange and sharing of knowledge and information that you need for enterprise ranked priority number 2? \_\_\_\_\_
22. a. Je kikundi chako cha wakulima kilisaidia usamabazaji na uenezaji wa habari na ujuzi unaohusika na mradi ya uzalishaji uliyopatia umuhimu nambari 2? \_\_\_\_\_
- Yes / Ndio ☐ No / Ndio ☐ If no, go to question 23.
- b. In what ways did the group's intervention help or hinder your farming activities? \_\_\_\_\_
- b. Kikundi chako cha wakulima kilisaidia au kuzuia shughuli zako za kilimo kwa njia gani? \_\_\_\_\_
- c. What were the outcomes of the information shared by your group (probe attracted widespread participation from farmers, increased understanding, improved communication, built trust among small-scale farmers, enhanced a sense of community, increased awareness of agricultural knowledge / marketing opportunities, increased adoption of new technologies / improved farming systems, contributed to change in farming practices, improved agricultural productivity)? \_\_\_\_\_
- c. Kulikua na matokeo gani baada ya kikundi chako kusambaza habari (dadisi kuhusu, kuvutia wakulima wengine ili kushirikishwa, uongezekaji wa ujuzi na kufahamu, kuboresha mawasiliano,

kujenga kuaminiana kati ya wakulima wadogo, kuongeza hali ya mawasiliano, kueneza ujuzi / elimu kuhusu mafunzo ya ukulima / upanuzi wa soko, kuleta mbinu mpya za teknolojia / uboreshaji wa mbinu mpya za ukulima, kuleta mabadiliko kwenye shughuli za ukulima, kuboresha miradi ya uzalishaji)?

23. a. Do you share the external agriculture-related information that you access from other sources (besides that from the farmers' group)? Yes / **Ndio** ☐ No / **La** ☐

If no, go to question 24.

23. **Wewe hugawa au kusambaza habari za kilimo kutoka nje na watu wengine?**

b. If yes, with whom do you share the agriculture-related information that you access?

b. **Kama ndio, je unagawia au husambazia nani habari za kilimo unazopata?** \_\_\_\_\_

c. How do you share this information? \_\_\_\_\_

c. **Je unagawa au kusambaza vipi habari za kilimo unazopata?**

d. Why do you share that information? \_\_\_\_\_

d. **Kwa nini unasambaza habari hizi?**

e. What barriers or constraints do you encounter in finding and sharing of information?

e. **Je unapata vikwazo au vizuizi au matatizo gani unaposambaza habari au ujumbe wa kilimo?**

f. How do these barriers or constraints affect your activities pertaining to the key enterprises identified above? \_\_\_\_\_

f. **Vizuizi au matatizo au vikwazo hivyo hutatiza vipi shughuli za kilimo za miradi muhimu ya uzalishaji uliyotaja hapo awali?**

g. What would help overcome the barriers or constraints you encounter in accessing and sharing information? \_\_\_\_\_

g. **Kitu gani kinaweza kusaidia kuepuka na vizuizi au matatizo au vikwazo unavyopata wakati unapotafuta au unaposambaza habari?**

24. a. Do you share the local and / or indigenous agricultural knowledge you possess?

Yes / **Ndio** ☐ No / **La** ☐ If no, go to question 25

24. a. **Je wewe husambaza ujuzi wa kilimo wa kiasili (kitamaduni) na / au wa kinyumbani?**

b. If yes, with whom do you share the local and or indigenous agricultural knowledge that you possess?

b. **Kama ndio, unawamsambazia nani ujuzi wa kiasili na / au wa kinyumbani?**

c. How do you share the local and or indigenous agricultural knowledge? \_\_\_\_\_

c. **Unasambaza vipi ujuzi wa kilimo ya kiasili na / au ya kinyumbani?**

d. Why do you share the local and or indigenous agricultural knowledge that you possess?

d. **Ni kwa nini unawasambazia wenzako ujuzi huo wa kilimo cha kiasili na / au cha kinyumbani?**

e. What barriers or constraints do you encounter in sharing local and or indigenous agricultural knowledge? \_\_\_\_\_

e. **Una vikwazo au matatizo au vizuizi vyovyote au pingamizi yoyote kwenya kusambaza ujuzi wa kiasili na au wa kinyumbani?**

f. How do these barriers or constraints affect your activities pertaining to the key enterprises identified above? \_\_\_\_\_

f. **Vizuizi au matatizo hayo huthuru au kuzuia vipi utekelezaji wa miradi muhimu ya uzalishaji uliyotaja awali?**

g. What would help overcome the barriers or constraints that you encounter in the sharing of local and or indigenous knowledge? \_\_\_\_\_

g. **Nini ingeweza kutatua matatizo au kuzuia vikwazo au vizuizi hivyo unavyopata unaposambaza ujuzi wa kiasili na / au wa kinyumbani?**

25. a. Do you combine external agriculture information and local and or indigenous knowledge in your farming activities? Yes / **Ndio** ☐ No / **La** ☐ If no, go to 26.

25. a. **Je wewe huchanganya habari za kilimo toka nje pamoja na ujuzi wa kilimo cha kiasili na au cha kinyumbani katika shughuli zako za kilimo?**

b. If yes, narrate an example of how you have combined the external information and local and / or indigenous knowledge you possess and explain the steps you took? \_\_\_\_\_

b. **Kama ndio, je unaweza kutoa mfano wa jinsi umeweza kuchanganya habari za kilimo na elimu au ujuzi wa kilimo wa kiasili na / au wa kinyumbani na ueleze hatua uzizofuata?**

c. Why do you combine external information and local and or indigenous knowledge (probe for how the merged information and knowledge help your farming activities)?

c. **Kwa nini unachanganya hizi habari na ujuzi wa kilimo wa kiasili na au wa kinyumbani (dadisi kuhusu jinsi mchanganyiko huu wa habari na ujuzi wa kiasili umesaidia shughuli za kilimo)?**



26. a. Is there any particular kind of agricultural information, or advice, or training you need on a technology you would like to introduce or on production but do not have enough information about?  
Yes / Ndio ☐ No / La ☐
26. a. Je unahitaji aina yeyote ya habari au ushauri au mafunzo juu ya teknolojia mpya au shughuli za kilimo ambazo kwa sasa huna habari za kutosha?
- b. What are the reasons for not having enough information and knowledge about this technology or production system? \_\_\_\_\_
- b. Ni kwa sababu gani hauna habari na ujuzi wa kutosha kuhusu teknolojia hii au mbinu ya kilimo?
- c. What information, advice or training do you need? \_\_\_\_\_
- c. Unahitaji habari, ushauri au mafunzo ya aina gani?
- d. Have you tried to get this information, advice or training?  
d. Je umejaribu kupata habari, ushauri au mafunzo hayo?  
Yes / Ndio ☐ No / La ☐ If no, go to question 27.
- e. If yes, what happened? If not, why have you not tried to get it? \_\_\_\_\_
- e. Kama ndio, eleza ulitafuta wapi na kulitendeka nini? Kama jibu ni la, ni kwanini hujajaribu kupata hizo habari?
- f. How did this affect your farming activities regarding the enterprises identified above?  
f. Je jambo hili liliathiri vipi shughuli zako za kilimo zinazohusu miradi uliyotaja awali?
- g. What were the outcomes? \_\_\_\_\_
- g. Kulikua na matokeo gani?

**D. Sources of local and / or indigenous agricultural knowledge and external information / Chanzo cha habari za nje na ujuzi wa kiasili / kinyumbani za kilimo**

27. a. What are your main sources of advice and information and knowledge on farming?

27. a. Ni vipi vyanzo muhimu vya ushauri na habari au ujuzi wa kilimo unavyotumia?

- b. Why do you consider these the main sources? \_\_\_\_\_

- b. Kwanini unahisi kwamba vyanzo hivi ndivyo muhimu zaidi?

- c. What information do you get from each of these major sources? \_\_\_\_\_

- c. Unapata habari gani toka kila moja wapo ya vyanzo hivyo?

Source /

Chanzo Type of information / Aina ya habari

- d. How frequently do you get information from the main sources for the enterprise ranked priority number 1? (weekly, monthly, bi-monthly, three times a year, twice a year, once a year, other (specify))

- d. Wewe hupata habari au ujuzi kutoka kwenye vyanzo muhimu ulivyopatia umuhimu nambari 1 mara ngapi? (kila wiki, kila mwezi, mara tatu kwa mwaka, mara mbili kwa mwaka, mara moja kwa mwaka, nyingine (fafanua)).

Source of information Chanzo cha habari	Frequency of accessing information / Mara ngapi

- e. How easy or difficult is it for you to access the sources of the enterprise ranked priority number 1 (Likert 1-5 1=very easy, 5=very difficult)

- e. Je ni rahisi au vigumu vipi kwako wewe kupata habari kutoka chanzo cha mradi ulichopatia umuhimu nambari 1 hapo awali? 1=rahisi sana, 5=vigumu sana)

Source / Chanzo:	(rahisi sana)	(vigumu sana)
1 _____	1= very easy	2 3 4 5=very difficult
2 _____	1= very easy	2 3 4 5=very difficult
3 _____	1= very easy	2 3 4 5=very difficult
4 _____	1= very easy	2 3 4 5=very difficult

- f. How reliable is the information or advice you get for each of the sources of the enterprise ranked priority number 1 (Likert 1-5 1=very reliable 5=not at all)?

- f. Habari za kilimo au ushauri unaopata toka vyanzo mbali mbali vya mradi nambari 1 ni za kuaminika kiwango gani (1=inaaminika kabisa 5=haiaminiki kamwe)?

Source / Chanzo:	(inaaminika kabisa)	(haiaminiki kamwe)
1 _____	1= very reliable	2 3 4 5=not reliable
2 _____	1= very reliable	2 3 4 5= not reliable
3 _____	1= very reliable	2 3 4 5= not reliable
4 _____	1= very reliable	2 3 4 5= not reliable

g. How useful is the information or advice you get for each of the sources of the enterprise ranked priority number 1 (Likert 1-5 1=very useful 5=not useful)?

g. Habari hizi au ushauri huo unaopata kutoka vyanzo mbali mbali kuhusu mradi wa uzalishaji mlioupatia umuhimu nambari 1 zina manufaa kiasi gani (Likert 1-5 1=very useful 5=not useful)?

Source / Chanzo: (inaleta manufaa sana) (haileti manufaa kamwe)

1 _____	1= very useful	2	3	4	5=not useful
2 _____	1= very useful	2	3	4	5= not useful
3 _____	1= very useful	2	3	4	5= not useful
4 _____	1= very useful	2	3	4	5= not useful

28. What are your main sources of market information for the enterprise ranked priority number 1 (local market and export)? (probe Cooperative, farmers' group, NAFIS, KACE, Foodnet, market, neighbours).

28. Unatumia vyanzo gani muhimu kupata habari za soko za mradi ulioipatia umuhimu nambari 1 hapo awali (soko la nyumbani na soko la nje) (dadisi chama cha ushirika, kikundi cha wakulima, NAFIS (National Farmers Information Service), KACE (Kenya Agricultural Commodity Exchange), Foodnet, majirani)?

29. a. What are your main sources of information and knowledge for the enterprise ranked priority number 2 (probe for local, indigenous and external sources)? \_\_\_\_\_

29. a. Vyanzo muhimu vya habari na ujuzi vinayosaidia ukuzaji wa miradi uliyopatia umuhimu nambari 2 hapo awali ni vipi (dadisi kuhusu vyanzo vya kiasili, vya kinyumbani na za kutoka nje ya kijiji)?

b. What information do you get from the sources mentioned above for the enterprise ranked priority number 2?

b. Wewe hupata habari gani kutoka kwenye asili mbali mbali kuhusu miradi ya uzalishaji uliyopatia umuhimu nambari 2 hapo awali?

Source / Chanzo (enterprise / mradi 2) Type of information / Aina ya habari

c. How easy / difficult is it for you to access the sources for the enterprise ranked priority number 2 (Likert 1-5 1=very easy, 5=very difficult)

c. Je ni rahisi vipi au vigumu vipi kwako kupata habari kutoka vyanzo vya miradi nambari 2. (1=rahisi sana, 5=vigumu sana)

Source / Chanzo:	(rahisi sana)				(vigumu sana)
1 _____	1= very easy	2	3	4	5=very difficult
2 _____	1= very easy	2	3	4	5=very difficult
3 _____	1= very easy	2	3	4	5=very difficult
4 _____	1= very easy	2	3	4	5=very difficult

d. How reliable is the information or advice you get for each of the sources of the enterprise ranked priority number 2 (Likert 1-5 1=very reliable 5=not reliable)?

d. Je habari hizi au ushauri huo unaopata kutoka vyanzo mbali mbali vya miradi ya uzalishaji nambari 2 ni vya kuaminika kiasi gani? (Likert 1-5 1=inaaminika kabisa 5=haiaminiki kamwe)?

Source / Chanzo: (inaaminika kabisa) (haiaminiki kamwe)

1 _____	1= very reliable	2	3	4	5=not reliable
2 _____	1= very reliable	2	3	4	5= not reliable
3 _____	1= very reliable	2	3	4	5= not reliable
4 _____	1= very reliable	2	3	4	5= not reliable

e. How useful is the information or advice your group gets for each of the sources of the enterprise ranked priority number 2 (Likert 1-5 1=very useful 5=not useful)?

e. Habari hizi au ushauri huo unaopata kutoka vyanzo mbali mbali kuhusu miradi ya uzalishaji uliopatia umuhimu nambari 2 vina manufaa kiasi gani?

(Likert 1-5 1=very useful 5=not useful)?

Source / Chanzo: (inaleta manufaa sana) (haileti manufaa kamwe)

1 _____	1= very useful	2	3	4	5=not useful
2 _____	1= very useful	2	3	4	5= not useful
3 _____	1= very useful	2	3	4	5= not useful
4 _____	1= very useful	2	3	4	5= not useful

f. To what extent is the information available from these sources relevant to your needs for the enterprise ranked priority number 2?

f. Habari za kilimo unazopata toka vyanzo hivi vinafungamana vipi na mahitaji yako kuhusu miradi ya uzalishaji uliopatia umuhimu nambari 2?

Source / Chanzo: (hazifungamani kamwe) (zinafungamana kabisa)

1 _____	1= not relevant at all	2	3	4	5=very relevant
2 _____	1= not relevant at all	2	3	4	5=very relevant
3 _____	1= not relevant at all	2	3	4	5=very relevant

4 \_\_\_\_\_ 1= not relevant at all 2 3 4 5=very relevant

30. What are your main sources of market information for the enterprise ranked priority number 2 (local market, town market, export) (probe Cooperative, farmers' group, NAFIS, KACE, Foodnet, market, neighbours)? \_\_\_\_\_

30. Ni vipi vyanzo muhimu vya habari za soko vya miradi ya uzalishaji uliopatia umuhimu nambari 2 hapo awali (soko la nyumbani na soko la nje) (dadisi chama cha ushirika, kikundi cha wakulima NAFIS (National Farmers Information Service), KACE (Kenya Agricultural Commodity Exchange), Foodnet, majirani)?

31. a. What information do you get for the main enterprises you deal with from your farmers' group (probe for farmer group as a source of information and knowledge if not already mentioned by farmer above)?

31. a. Je unapata habari gani kutoka kwa kikundi chako zinazohusika na miradi muhimu ya uzalishaji (dadisi kuhusu kikundi cha wakulima kama chanzo cha habari na ujuzi kama hakikutajwa hapo juu)?

b. In what ways did the group's intervention help or hinder your farming activities in relation to the main enterprises? \_\_\_\_\_

b. Kuingilia kati kwa kikundi chako cha wakulima kulisaidia au kutatiza vipi shuguli zako za kilimo zinazohusika na miradi muhimu ya uzalishaji?

c. What were the outcomes (in relation to main enterprises)? \_\_\_\_\_

c. Kuingilia kati kwa kikundi chako cha wakulima kulileta matokeo gani yanayohusika na miradi muhimu wa uzalishaji?

#### E *Linkages and channels of communication / Viunganishi na njia za mawasiliano*

32. a. What are your major thoughts about being a member of a farmers' group?

32. a. Je una fikira gani muhimu kuhusu kujumuika kwako na kikundi cha wakulima?

b. How has being a member of the group helped improve your agricultural activities?

b. Kuwa mwanachama wa kikundi cha wakulima kimechangia vipi uimarishaji wa shuguli zako za kilimo? \_\_\_\_\_

c. What have been your major benefits of joining a farmers' group? \_\_\_\_\_

c. Je umeona manufaa gani makubwa tangu ujiunge na kikundi cha wakulima?

d. Are there any impacts in terms of farming activities resulting from being a member of a farmers' group (positive or negative)? Yes / ☐ Ndio ☐ No / ☐ La ☐ If no, go to question 33.

d. Umeona mabadiliko yeyote tangu uwe mwanachama wa kikundi cha wakulima (mazuri au mabaya)?

e. If yes, how has your joining a group changed your farming activities? \_\_\_\_\_

e. Kama ndio, uwanachama au uanakikundi umeleta mabadiliko au maendeleo gani kwenye shughuli zako za ukulima?

f. Are there any other (non-farming) impacts resulting from being a member of a farmers' group?

Yes / ☐ Ndio ☐ No / ☐ La ☐ If no, go to question 33.

f. Kuna mabadiliko mengine (yasiyo ya kilimo) kutokana na kuwa mwanakikundi?

g. If yes, what non-farming impacts have resulted from your group membership?

g. Kama ndio, uwanakikundi umeleta mabadiliko gani yasiyo ya kilimo?

33. a. I am going to mention a list of some communication methods used for capturing and sharing local and / or indigenous agricultural knowledge. Please indicate which ones you have had some experience with (for accessing and sharing agricultural knowledge and information)?

33. a. Nitakutajia orodha ya njia za upelekaji wa habari zinazotumika kukamata na kusambaza ujuzi ya kilimo ya kiasili au ya kinyumbani. Tafadhali onyesha ni zipi umeweza kutumia kwa (kupata na kusambaza habari za kilimo na ujuzi wa kitamaduni au wa kienyeji)?

Communication methods used to capture and share local or indigenous knowledge / njia za upelekaji wa habari ninazotumika kukamata na kusambaza ujuzi wa kilimo wa kiasili au wa kinyumbani. Drama / michezo ya kuigiza Stories / hadithi Song / nyimbo Artifacts / vinyago Meetings or barazas / mikutano au baraza Exchange visits / ziara za kubadilishana Study tours / safari ya kutazama na	Tick as applies	Communication methods used to capture and share local or indigenous knowledge / njia za upelekaji wa habari ninazotumika kukamata na kusambaza ujuzi wa kilimo wa kiasili au wa kinyumbani. Radio / redio WorldSpace radio Television / televisheni Video Telephone (land line) / simu ya ardhi  Cellular phone / simu ya mkono Internet / mtandao wa intanet	Tick as applies
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kujifunza Demonstration / maonyesho ya kuonyesha matendo Shows / shoo Word of mouth passed on from elders and earlier generations / mawaidha na ujuzi iliotokana na wazee wa kale uliopitishwa kwa mdomo Neighbours / majirani Print (specify) / chapa (fafanua)	PDA / compyuta ndogo ya mkononi Others (specify) / nyingine
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b. How effective have each of these communication methods been to you in accessing and / or sharing agricultural knowledge and information? (not effective at all =1 very effective =5)

b. Kwa kila njia au chombo cha uwasiliano ambacho umetumia kupata au kusambaza habari au ujuzi wa kilimo, je kimekufaa kwa njia gani?

(not effective at all / hakikutufaa kamwe =1 / very effective / kilifufaa kikamilifu kabisa =5)

Njia / chombo cha uwasiliano

Communication methods (hakikunifaa kikamilifu kamwe) kilinifaa kikamilifu kabisa

1 _____	1= not effective at all	2	3	4	5=very effective
2 _____	1= not effective at all	2	3	4	5=very effective
3 _____	1= not effective at all	2	3	4	5=very effective
4 _____	1= not effective at all	2	3	4	5=very effective
5 _____	1= not effective at all	2	3	4	5=very effective

c. How much experience do you have with these methods? (very little =1 very much =5).

c. Je una ujuzi kiasi gani kuhusu matumizi ya njia hizi au vyombo hivi vya uwasiliano? (very little / kidogo sana =1 very much / ujuzi mwingi sana=5)?

Communication methods

Njia / chombo cha uwasiliano

	Kidogo sana				mwingi sana
1 _____	1= very little	2	3	4	5=highly experienced
2 _____	1= very little	2	3	4	5= highly experienced
3 _____	1= very little	2	3	4	5= highly experienced
4 _____	1= very little	2	3	4	5= highly experienced
5 _____	1= very little	2	3	4	5= highly experienced

d. How did these communication methods relate to your main enterprises?

d. Je, njia hizi au vyombo hivi vya uwasiliano zilichangia au kusaidia vipi miradi yako muhimu ya uzalishaji? \_\_\_\_\_

34. a. Now I want you to go back to the ICTs you have used. What three ICTs do you prefer to use for accessing agricultural information and knowledge (give an overall ranking in order of preference)?

34. a. Sasa nataka mutafakari teknolojia za mawasiliano ya habari ambazo mumetumia kupata au kusambazia habari za ukulima na ujuzi au elimu ya kienyeji au ya kitamaduni. Wewe binafsi unapendelea teknolojia gani tatu muhimu zaidi za mawasiliano ya habari?

1 \_\_\_\_\_  
 2 \_\_\_\_\_  
 3 \_\_\_\_\_

b. Why do you prefer these ICTs (describe how have you applied these ICTs)?

b. Ni kwa nini unapendelea hizi teknolojia za mawasiliano ya habari (elezea umezitumia vipi teknolojia hizo za mawasiliano ya habari)? \_\_\_\_\_

c. What feelings do you have in connection with their use? \_\_\_\_\_

c. Je una hisia au maoni gani kuhusu matumizi ya teknolojia hizo?

d. How did these feelings relate to your farming activities? \_\_\_\_\_

d. Je hisia au maoni hayo yalichangia vipi kwenye shuguli zako za ukulima

e. How has the use of ICTs impacted on your life in relation to farming activities?

e. Je teknolojia hizi za mawasiliano ya habari zimebadilisha vipi maisha yako kuhusu kilimo? \_\_\_\_\_

f. What were the outcomes in terms of farming activities? \_\_\_\_\_

f. Je, matumizi ya hizi teknolojia za mawasiliano ya habari zimeleta matokeo gani?

35. What barriers or constraints have you experienced using these ICTs? \_\_\_\_\_

35. Je umepata vikwazo au vizuizi gani kwenye matumizi ya hizi teknolojia za mawasiliano ya habari?

**F Usage of agricultural knowledge and information / Matumizi ya ujuzi na habari za kilimo**

36. a. Do you use external agricultural information in your agricultural practices?

36. a. Je wewe hutumia habari za kilimo zitokazo nje kwenye shuguli zako za kilimo?

Yes /

Ndio ☐ No / No ☐ If no, go to question 37.

b. If yes, describe how you have used external agricultural information on crop production or pest management or a new technology provided by research or extension or training or other information providers and how you used it? \_\_\_\_\_

b. Kama ndio, elezea jinsi ulivyotumia habari za kilimo za kutoka nje, kama vile za ukuzaji wa miradi ya uzalishaji au wadudu waharibifu au teknolojia mpya iliyotoka kwenye vituo vya watafiti, au waenezaji wa kilimo au vituo vya mafunzo au kwingineko?

c. Why do you use external agricultural information? \_\_\_\_\_

c. Kwa nini unatumia habari za kilimo kutoka nje?

d. How frequently do you use external agricultural information (probe weekly, monthly, bi-monthly, three times a year, two times a year, annually, other (specify)?)

d. Wewe hutumia habari hizo mara ngapi (dadisi kila wiki, kila mwezi, kila miezi miwili, mara tatu kwa mwaka, mara mbili kwa mwaka, mara moja kwa mwaka)?

<i>External information used / Habari za kilimo za nje</i>	<i>Frequency used / Mara ngapi</i>

e. How does the external agricultural information relate to local and / or indigenous agricultural knowledge? \_\_\_\_\_

e. Je habari za kilimo zitokazo nje (kwa watafiti au vituo vingine) inahusiana vipi na ujuzi wa kiasili na / au kinyumbani?

f. What were your feelings or emotions about mixing local and or indigenous knowledge and external knowledge? \_\_\_\_\_

f. Una hisia gani au maoni gani kuhusu uchanganyaji wa ujuzi wa kiasili na / au wa kinyumbani, na habari za kilimo za nje?

g. What constraints / barriers did you encounter in mixing local and / or indigenous agricultural knowledge and external information? \_\_\_\_\_

g. Ulipata matatizo au vikwazo au vizuizi gani kwenye kuchanganya ujuzi ya kiasili na au ya kinyumbani na habari za kilimo toka nje?

37. a. Describe a specific instance(s) when you made a major decision / innovation / solved a problem as a result of using some item of agricultural knowledge or / and information (mention the steps the group took).

37. a. Simulia au arifia wakati ambao ulifanya uamuzi muhimu / ugrunduzi au uvumbuzi / utatuzi wa shida / kuzidisha ufahamu baada ya kutumia habari za kilimo au ujuzi / elimu ya kilimo (fafanua kulitokea nini kipindi hicho na ni hatua gani mulichukua).

b. What knowledge and / or information helped you to make the decision / innovation / solve a problem / understanding? \_\_\_\_\_

b. Ni habari / ujuzi gani ya kilimo yaliyokusaidia kufanya uamuzi / uvumbuzi au ugrunduzi / kutatua shida / kuzidisha ufahamu?

c. Were you satisfied with the decision / innovation / problem solved / understanding you made?

c. Je uliridhika na uamuzi uliofanya / ugrunduzi au uvumbuzi / utatuzi wa shida / uzidishaji wa ufahamu? Yes / Ndio ☐ No / La ☐ If no, go to question 38.

d. To what extent were you satisfied?

d. Je uliridhika kiasi gani na uamuzi uliofanya?

1= not satisfied at all      2      3      4      5=highly satisfied  
sikuridhika kamwe      niliridhika kabisa

e. Did you have any difficulties arriving at the innovation / solution?

e. Ulipata shida yeyote kufanya uvumbuzi au kupata suluhisho?

Yes / Ndio ☐ No / La ☐

f. If yes, what difficulties did you experience in arriving at the innovation / solution?

f. Kama ndio, mlipata shida gani kufanya uvumbuzi au kupata suluhisho? \_\_\_\_\_

38. a. How does your individual decision making / innovation / problem solving / understanding process differ from group decision making (compare a specific individual incident to one made by your farmers' group)?



38. a. Kuna tofauti gani kati ya kufanya uamuzi wa kibinafsi na kufanya uamuzi / / ugunduzi au uvumbuzi / utatuzi wa shida / uzidishaji wa ufahamu ya kikundi cha wakulima (elezea ukitumia mfano unaoenyeshwa tofauti hizi za kikundi na ubinafsi)?

b. Do you prefer group decision making or individual decision making?

b. Unapendelea kufanya maamuzi ya kibinafsi au ukiwa kwenye kikundi?

Group / maamuzi ya kikundi ☐ Individual / maamuzi ya kibinafsi ☐

c. What are your reasons for this preference? \_\_\_\_\_

c. Kwa nini unapendelea njia hii ya kufanya uamuzi?

d. What needs to be done to improve decision making / innovation / problem solving understanding within the group? \_\_\_\_\_

d. Una maoni gani au mawaidha gani kuhusu uboreshaji wa kufanya maamuzi / ugunduzi au uvumbuzi / utatuzi wa shida / kuzidisha ufahamu?

e. What needs to be done to improve your individual decision making / innovation / problem solving understanding? \_\_\_\_\_

e. Una maoni gani au mawaidha gani kuhusu uboreshaji wa kufanya maamuzi / ugunduzi au uvumbuzi / utatuzi wa shida / kuzidisha ufahamu wa kibinafsi?

39. a. Is the knowledge and information generated and shared by the key actors in the district (for example by researchers, extensionists, education and training institutions and farmers) sufficient for addressing your needs? Yes / Ndio ☐ No / La ☐

39. a. Je ujuzi na habari za kilimo zitokazo kwa washikadau walioko kwenye wilaya yenu zinatoshia mahitaji yako ya ukulima?

b. If no, how do you go about seeking additional information and knowledge?

b. Kama la, eleza unatafuta vipi habari nyingine za kilimo na ujuzi. \_\_\_\_\_

c. If you had power, what would you like to see in the community (in relation to local and / or indigenous or external agricultural information and knowledge)? \_\_\_\_\_

c. Kama ungekua na uwezo, ni mabadiliko gani ungefanya kwenye kijiji yenu kuhusu habari na ujuzi ya kilimo za kijinini na za kutoka nje ya kijiji?

#### **G Knowledge management and information management/ Usimamizi wa ujuzi na usimamizi wa habari**

40. a. Have you been involved in the capturing and recording of local or indigenous knowledge you possess (probe writing, taping, video, audio-tape, drama, song, artifact, knowledge base)? Yes / Ndio ☐

No / La ☐ If no, go to question 41.

40. a. Je umewahi kuhusika katika shuguli za kunasa na kurekodi ujuzi ya kilimo ya kiasili na / au ya kinyumbani (dadisi kwa maadishi, utepe, video, michezo ya kuigiza, benki ya ujuzi)?

b. If yes, could you describe the instance (describe the steps you took in recording)?

b. Kama ndio, unaweza kusimulia jinsi ulivyofanya (simulia hatua ulizochukua)?

c. Why did you record the knowledge? \_\_\_\_\_

c. Kwanini ulirekodi ujuzi huo wa kilimo?

d. Did you share the knowledge you recorded with any other person(s)?

d. Je uligawanyia au kusambazia watu wengine ujuzi huo uliyorekodi?

Yes / Ndio ☐ No / La ☐

e. If yes, who did you share the knowledge with? \_\_\_\_\_

e. Kama ndio, uligawia nani au ulisambazia nani ujuzi hayo?

f. How did you share the knowledge? \_\_\_\_\_

f. Ulisambaza vipi ujuzi huo?

g. Why did you share the knowledge? \_\_\_\_\_

g. Kwa nini ulisambaza ujuzi huo?

h. What challenges or barriers did you encounter in sharing the local and / or indigenous knowledge?

h. Ulipata vikwazo au matatizo gani wakati ulipokua ukisambaza ujuzi huo wa kiasili na / au wa kinyumbani?

#### **H Improved AKIS model**

41. Suggest ways through which the different actors, institutions and rural people can improve the sharing of knowledge and information on the agricultural enterprises you mentioned above.

41. Una mashauri gani kuhusu jinsi washikadau mbali mbali, vituo na wanakijiji wanaweza kuimarisha usambazaji wa habari za kilimo na ujuzi wa miradi muhimu ya uzalishaji.

42. Is there anything you want to add or comment on / Kuna chochote ungependa kuongeza?

## Appendix 12: Interview guide for individual farmers not belonging to a group

### A. General

Date / Tarehe: \_\_\_\_\_ Code / Kodi: \_\_\_\_\_

1. Name (respondent) / Jina la anachojiwa: \_\_\_\_\_

2. Gender / Jinsia: Male / Mke ☐ Female / Mke ☐

3. Age / Umri: 15-25 ☐ 26-35 ☐ 36-45 ☐ 46-50 ☐

51-60 ☐ 61-70 ☐ 71-80 ☐ > 80 ☐

4. Division / Kata: \_\_\_\_\_ 5. Location / Tarafa: \_\_\_\_\_

6. Sub-location / Kijiji: \_\_\_\_\_

7. Are you the head of your household? Yes / Ndio ☐ No / No ☐

7. Je wewe ndiwe mkuu wa nyumba?

8. Household type and education level (tick as appropriate).

8. Aina ya nyumba na kiwango cha elimu (chagua vilivyo).

a.	Male headed / Nyumba inaongozwa na mme	Female headed / Nyumba inaongozwa na mke	Child <sup>93</sup> headed / Nyumba inaongozwa na mtoto
b. Education level b. Kiwango cha elimu None / Sikusoma Primary / Elimu ya msingi Secondary / Elimu ya upili College / Chuo cha kati University / Chuo kikuu			

### B. Agricultural enterprise(s) / Miradi ya uzalishaji

9. What are your main farming objectives? \_\_\_\_\_

9. Madhumuni au malengo yako ya kilimo ni yapi?

10. What are the main agricultural enterprises of your household (probe if horticulture, tea, coffee, dairy, maize, bananas)? \_\_\_\_\_

10. Ni ipi miradi muhimu zaidi ya uzalishaji kwenye nyumba yako (dadisi kama kilimo cha mboga mbali mbali, majani chai, kahawa, mahindi, ng'ombe wa maziwa, ndizi)?

11. What was it that led you to deciding on these agricultural enterprises? \_\_\_\_\_

11. Nini ilikufanya uamue kuchagua miradi hii ya uzalishaji?

12. Could you list the agricultural enterprises in the categories provided and give an overall ranking (with one as most important)?

12. Unaweza kuorodhesha miradi hiyo ya uzalishaji kulingana na umuhimu kwenye makundi yafuatayo (nambari moja ikiwa muhimu zaidi)?

	Enterprise / mradi	Cash / kilimo cha mapato	Subsistence / Kilimo cha matumizi	Other / Mengine
1				
2				
3				
4				
5				

13. Why do you rank the agricultural enterprise in this priority (probe for criteria considered for ranking)?

13. Kwanini umeorodhesha hivi miradi hiyo ya uzalishaji (dadisi vigezo vilivyotumika)?

No. / Nambari	Criteria considered for ranking / Utaratibu uliotumika kuorodhesha mazao
1	
2	
3	
4	
5	

14. a. Looking back on any decisions you have made about these agricultural enterprises, what feelings have you had in connection with these decisions? \_\_\_\_\_

14. a. Ukitafakari maamunuzu au uamuzi uliopitisha kuhusu miradi hii muhimu ya uzalishaji, una hisia gani au maoni gani kulingana na maamuzi au uamuzi uliofanya (dadisi kama alikua katika hali gani wakati huo)?

b. What were your questions at the time of making the decision/s? \_\_\_\_\_

b. Ulijiuliza maswali gani kwa wakati ulipokua ukifanya maamuzi?

c. Did those feelings change you? Yes / Ndio ☐ No / La ☐

If no, go to question 15a.

c. Je maoni au hisia hizo zilikubadilisha?

<sup>93</sup> Child – under 15 years

- d. If yes, how did the feelings change you? \_\_\_\_\_
- d. Kama ndio, je hisia hizo zilikubadilisha vipi?
15. a. Looking back on any decisions you have made about these agricultural enterprises, name any ways in which these decisions have impacted on your life in relation to farming.
15. a. Ukitafakari maamuzi au uamuzi wa hapo awali kuhusu miradi ya uzalishaji, taja njia ambazo maamuzi hayo yamebadilisha maisha yako kwenye mambo ya ukulima. \_\_\_\_\_
- b. What was happening in your life at the time that you decided on the enterprise(s)?
- b. Ulikuwa unajishughulisha na nini maishani mwako kabla ya kuanzisha miradi hiyo?
- c. Was there anything that helped you arrive at this decision on the enterprise(s)?
- Yes / Ndio ☐ No / La ☐ If no, go to question 16.
- c. Je kulikua na kitu chechote ambacho kilikusaidia kuamua juu ya mradi / miradi hiyo?
- d. If yes, what helped this situation? \_\_\_\_\_
- d. Kama ndio, nini ilisaidia kwa wakati huo?
- e. Did the choice of enterprise help your farming activities?
- Yes / Ndio ☐ No / La ☐ If no, go to g. / Kama la, jibu sehemu ya g.
- e. Je chaguo la miradi lilikusaidia shughuli zako za kilimo?
- f. If yes, what was helpful in the choice of agricultural enterprise in relation to farming?
- f. Kama ndio, uamuzi wa mradi au miradi ulisaidia vipi shughuli zako za kilimo? \_\_\_\_\_
- g. Did the choice of enterprise hinder your farming activities?
- Yes / Ndio ☐ No / La ☐ If no, go to i.
- g. Je chaguo la mradi au miradi yalizuia shughuli zako?
- h. If yes, what was the hinderance in the choice of agricultural enterprise in relation to farming?
- h. Kama ndio, uamuzi wa mradi au miradi ulikuzuia vipi shughuli zako za kilimo?
- i. What were the outcomes (in terms of benefits or challenges to the farming) of the choice of agricultural enterprise(s)? \_\_\_\_\_
- i. Je chaguo la mradi / miradi hiyo lilikua na matokeo gani (yanayohusika na mapato au matatizo ya ukulima)?

**C. Information behaviour / Mwenendo wa habari**

16. What agricultural information and knowledge do you need for the enterprise ranked priority number 1?
16. Unahitaji habari na ujuzi gani wa kilimo unaohusika na mradi uliopatia umuhimu nambari 1?
17. How do you go about seeking for information and knowledge for the enterprise ranked priority number 1?
17. Wewe hutafuta vipi habari na ujuzi unaohusika na mradi wa uzalishaji uliopatia umuhimu nambari 1?
18. What information and knowledge do you need for the enterprises ranked priority number 2, 3, 4 and 5?
18. Je unahitaji habari na ujuzi gani wa kilimo unaohusika na miradi ya uzalishaji uliyolipatia umuhimu nambari 2, 3, 4 na 5? \_\_\_\_\_
19. How do you go about seeking for information and knowledge for enterprises ranked priority number 2, 3, 4 and 5?
19. Wewe hutafuta vipi habari na ujuzi unaohusika na miradi ya uzalishaji uliopatia umuhimu nambari 2, 3, 4 na 5? \_\_\_\_\_
20. a. Do you share the external agriculture-related information that you access from other sources?
- Yes / Ndio ☐ No / La ☐ If no, go to question 21.
20. Wewe hugawa au kusambaza habari za kilimo kutoka nje kwa watu wengine?
- b. If yes, with whom do you share the agriculture-related information that you access?
- b. Kama ndio, je unagawia au unasambaza nani habari za kilimo unazopata? \_\_\_\_\_
- c. How do you share this information? \_\_\_\_\_
- c. Unagawa au kusambaza vipi habari za ukilimo unazopata?
- d. Why do you share that information? \_\_\_\_\_
- d. Kwa nini unasambaza habari hizo?
- e. What barriers or constraints do you encounter in finding information?
- e. Je unapata vikwazo au vizuizi au matatizo gani unapotafuta habari au ujumbe wa kilimo?
- f. What barriers or constraints do you encounter in sharing of information?
- f. Je unapata vikwazo au vizuizi au matatizo gani unaposambaza habari au ujumbe wa kilimo?
- g. How do these barriers or constraints affect your activities pertaining to the key agricultural enterprises identified above? \_\_\_\_\_



- g. Vizuizi au matatizo au vikwazo hivyo hutatiza vipi shughuli za kilimo za miradi muhimu ya uzalishaji uliyotaja hapo awali?
- h. What would help overcome the barriers or constraints you encounter in finding information?
- 
- h. Kitu gani kinaweza kusaaidia kuepuka na vizuizi au matatizo au vikwazo unavyopata wakati unapotafuta habari?
- i. What would help overcome the barriers or constraints you encounter in sharing information?
- 
- i. Kitu gani kinaweza kusaaidia kuepuka na vizuizi au matatizo au vikwazo unavyopata wakati unaposambaza habari?
21. a. Do you share the local and / or indigenous agricultural knowledge you possess?  
Yes / **Ndio** ☐ No / **La** ☐ If no, go to question 22.
21. a. Je were husambaza ujuzi wa kilimo wa kiasili na / au wa kinyumbani?
- b. If yes, with whom do you share the local and or indigenous agricultural knowledge that you possess?
- 
- b. Kama ndio, unawamsambazia nani ujuzi huo wa kiasili na au wa kinyumbani?
- c. Could you narrate an incident where you shared this information? Explain how you shared the local and / or indigenous agricultural knowledge (probe to find out whether it was local or indigenous knowledge)? \_\_\_\_\_
- c. Unasambaza vipi ujuzi huo wa kilimo wa kiasili au wa kinyumbani?
- d. Why do you share the local and / or indigenous agricultural knowledge that you possess?
- 
- d. Ni kwa nini unawasambazia wenzako ujuzi huo wa kilimo cha kiasili na au wa kinyumbani?
- e. What barriers or constraints do you encounter in sharing local and / or indigenous agricultural knowledge? \_\_\_\_\_
- e. Una vikwazo au matatizo au vizuizi vyovyote au pingamizi yoyote kwenya kusambaza ujuzi wa kiasili na / au wa kinyumbani?
- f. How do these barriers or constraints affect your activities pertaining to the key agricultural enterprises identified above? \_\_\_\_\_
- f. Vizuizi au matatizo hayo huthuru au kuzuia vipi utekelezaji wa miradi muhimu ya uzalishaji uliyotaja awali? Vizuizi au matatizo hayo huthuru au kuzuia vipi utekelezaji wa miradi muhimu ya uzalishaji uliyotaja awali?
- g. What would help overcome the barriers or constraints you encounter in the sharing local and / or indigenous knowledge? \_\_\_\_\_
- g. Nini ingeweza kutatua matatizo au kuzuia vikwazo au vizuizi hivyo unavyopata unaposambaza elimu au ujuzi wa kiasili na / au wa kinyumbani?
22. a. Do you combine external agricultural information and local and / or indigenous knowledge in your farming activities? Yes / **Ndio** ☐ No / **La** ☐ If no, go to question 23.
22. a. Je wewe huchanganya habari za kilimo kutoka nje pamoja na elimu au ujuzi wa kilimo cha kiasili na / au cha kinyumbani katika shughuli zako za kilimo?
- b. If yes, narrate an example of how you have combined the external information and local and / or indigenous knowledge you possess and explain the steps you took?
- b. Kama ndio, je unaweza kutoa mfano wa jinsi umeweza kuchanganya habari za kilimo na elimu au ujuzi wa kilimo wa kiasili na / au wa kinyumbani na za kutoka nje halafu ueleze hatua uzilofwata?
- 
- c. Why do you combine external information and local and / or indigenous knowledge (probe for how the merged information and knowledge help farming activities)?
- c. Kwa nini unachanganya hizi habari na elimu au ujuzi wa kilimo wa kiasili na / au ya kinyumbani na za kutoka nje (dadisi kuhusu jinsi mchanganyiko huu wa habari na ujuzi wa kiasili umesaidia shughuli za kilimo)? \_\_\_\_\_
23. a. Is there any particular kind of agricultural information, or advice, or training you need on a technology you would like to introduce or on production but do not have enough information about? Yes / **Ndio** ☐ No / **La** ☐ If no, go to question 24.
23. a. Je unahitaji aina yeyote ya habari au mafunzo juu ya teknolojia mpya au shughuli za kilimo ambazo kwa sasa huna habari za kutosha?
- b. What are the reasons for not having enough information and knowledge? \_\_\_\_\_
- b. Ni kwa sababu gani hauna habari na ujuzi wa kutosha?
- c. What information, advice or training do you need? \_\_\_\_\_
- c. Unahitaji habari, ushauri au mafunzo ya aina gani?
- d. Have you tried to get this information, advice or training? \_\_\_\_\_
- d. Je umejaribu kupata habari, ushauri au mafunzo hayo? Yes / **Ndio** ☐ No / **La** ☐

- e. If yes, what happened? If not, why have you not tried to get it? \_\_\_\_\_
- e. Kama ndio, eleza ulitafuta wapi na kulitendeka nini? Kama la, ni kwanini hujajaribu kupata hizo habari?
- f. How did this affect your farming activities regarding the enterprises identified above?
- f. Je jambo hili liliathiri vipi shuguli zako za kilimo zinazohusu miradi uliyotaja awali?
- g. What were the outcomes of the choice of enterprise? \_\_\_\_\_
- g. Kulikua na matokeo gain kuhusu chaguo la miradi?

**D. Sources of local and / or indigenous knowledge and external information Chanzo cha habari za nje na elimu au ujuzi wa kilimo wa asili**

24. a. What are your main sources of advice and information and knowledge on farming?
24. a. Ni vipi vyanzo muhimu vya ushauri na habari au ujuzi wa kilimo unavyotumia?

- b. Why do you consider these the main sources? \_\_\_\_\_
- b. Kwanini unahisi kwamba vyanzo hivi ndivyo muhimu zaidi?
- c. What information do you get from each of these major sources?
- c. Unapata habari gani toka kila moja wapo ya vyanzo hivyo?
- Source / Chanzo Type of information / Aina ya habari

- d. How frequently do you get information from the main sources of the enterprise ranked priority number 1? (weekly, monthly, bi-monthly, three times a year, twice a year, once a year, other (specify))
- d. Were hupata habari au ujuzi kutoka kwenye vyanzo muhimu ulivyopatia umuhimu nambari 1 mara ngapi? (kila wiki, kila mwezi, mara tatu kwa mwaka, mara mbili kwa mwaka, mara moja kwa mwaka, nyingine (fafanua)).

Source of information / Chanzo cha habari	Frequency of accessing information / Mara ngapi

- e. How easy or difficult is it for you to access the sources of enterprise ranked priority number 1 (Likert 1-5 1=very easy, 5=very difficult)

- e. Ni rahisi au vigumu vipi kwako wewe kupata habari kutoka chanzo cha mradi ulichopatia umuhimu nambari 1 hapo awali? 1=rahisi sana, 5=vigumu sana)

Source / Asili: (rahisi sana)	(vigumu sana)
1 _____ 1= very easy	2 3 4 5=very difficult
2 _____ 1= very easy	2 3 4 5=very difficult
3 _____ 1= very easy	2 3 4 5=very difficult
4 _____ 1= very easy	2 3 4 5=very difficult

- f. How reliable is the information or advice you get for each of the sources of the enterprise ranked priority number 1 (Likert 1-5 1=very reliable 5=not at all)?

- f. Habari za kilimo au ushauri unaopata toka vyanzo mbali mbali vya mradi nambari 1 ni za kuaminika kiwango gani (1=inaaminika kabisa 5=haiaminiki kamwe)?

Source / Asili: (inaaminika kabisa)	(haiaminiki kamwe)
1 _____ 1= very reliable	2 3 4 5=not reliable
2 _____ 1= very reliable	2 3 4 5= not reliable
3 _____ 1= very reliable	2 3 4 5= not reliable
4 _____ 1= very reliable	2 3 4 5= not reliable

- g. How useful is the information or advice you get for each of the sources of the enterprise ranked priority number 1 (Likert 1-5 1=very useful 5=not useful)?

- g. Habari hizi au ushauri huo unaopata kutoka vyanzo mbali mbali kuhusu mradi wa uzalishaji mlioupatia umuhimu nambari 1 zina manufaa kiasi gani (Likert 1-5 1=very useful 5=not useful)?

Source / Asili: (inaleta manufaa sana)	(haileti manufaa kamwe)
1 _____ 1= very useful	2 3 4 5=not useful
2 _____ 1= very useful	2 3 4 5= not useful
3 _____ 1= very useful	2 3 4 5= not useful
4 _____ 1= very useful	2 3 4 5= not useful

25. What are your main sources of market information for the enterprise ranked priority number 1 (local market and export)? (probe Cooperative, farmers' group, NAFIS, KACE, Foodnet, market, neighbours).

25. Unatumia vyanzo gani muhimu kupata habari za soko za mradi ulioipatia umuhimu nambari 1 hapo awali (soko la nyumbani na soko la nje) (dadisi chama cha ushirika, kikundi cha wakulima, NAFIS (National Farmers Information Service), KACE (Kenya Agricultural Commodity Exchange), Foodnet, majirani)?

26. a. What are your main sources of information and knowledge for the agricultural enterprise ranked priority number 2 (probe for local, indigenous, and external sources)? \_\_\_\_\_

26. a. Vyanzo muhimu vya habari na ujuzi vinayosaidia ukuzaji wa miradi uliopatia umuhimu nambari 2 hapo awali ni vipi (dadisi kuhusu chanzo cha kiasili, cha kinyumbani, na za kutoka nje ya kijiji)?

b. What information do you get from the sources mentioned above for the agricultural enterprise ranked priority number 2? \_\_\_\_\_

b. Wewe hupata habari gani kutoka kwenye asili mbali mbali kuhusu miradi ya uzalishaji uliopatia umuhimu nambari 2 hapo awali?

Source (enterprise / mradi 2) Type of information / Aina ya habari

c. How easy / difficult is it for you to access the sources for the agricultural enterprise ranked priority number 2.

(Likert 1-5 1=very easy, 5=very difficult)

c. Je ni rahisi vipi au vigumu vipi kwako kupata habari kutoka vyanzo vya miradi nambari. (1=rahisi sana, 5=vigumu sana)

Source / Asili:	(rahisi sana)				(vigumu sana)
1 _____	1= very easy	2	3	4	5=very difficult
2 _____	1= very easy	2	3	4	5=very difficult
3 _____	1= very easy	2	3	4	5=very difficult
4 _____	1= very easy	2	3	4	5=very difficult

d. How reliable is the information or advice you get for each of the sources of the agricultural enterprise ranked priority number 2 (Likert 1-5 1=very reliable 5=not reliable)?

d. Je habari hizi au ushauri huo unaopata kutoka vyanzo mbali mbali vya miradi ya uzalishaji nambari 2 ni vya kuaminika kiasi gani? (Likert 1-5 1=inaaminika kabisa 5=haiaminiki kamwe)?

Source / Asili:	(inaaminika kabisa)				(haiaminiki kamwe)
1 _____	1= very reliable	2	3	4	5=not reliable
2 _____	1= very reliable	2	3	4	5= not reliable
3 _____	1= very reliable	2	3	4	5= not reliable
4 _____	1= very reliable	2	3	4	5= not reliable

e. How useful is the information or advice you get for each of the sources of the agricultural enterprise ranked priority number 2 (Likert 1-5 1=very useful 5=not useful)?

e. Habari hizi au ushauri huu unaopata kutoka vyanzo mbali mbali kuhusu miradi ya uzalishaji uliopatia umuhimu nambari 2, 3, 4 na 5 vina manufaa kiasi gani?

(Likert 1-5 1=very useful 5=not useful)?

Source / Asili:	(inaleta manufaa sana)				(haileti manufaa kamwe)
1 _____	1= very useful	2	3	4	5=not useful
2 _____	1= very useful	2	3	4	5= not useful
3 _____	1= very useful	2	3	4	5= not useful
4 _____	1= very useful	2	3	4	5= not useful

f. To what extent is the information available from these sources relevant to your needs for the agricultural enterprise ranked priority number 2?

f. Habari za kilimo unazopata toka vyanzo hivyo vinafungamana vipi na mahitaji yako kuhusu miradi ya uzalishaji uliopatia umuhimu nambari 2?

Source / Asili:	(hazifungamani kamwe)				(zinafungamana kabisa)
1 _____	1= not relevant at all	2	3	4	5=very relevant
2 _____	1= not relevant at all	2	3	4	5=very relevant
3 _____	1= not relevant at all	2	3	4	5=very relevant
4 _____	1= not relevant at all	2	3	4	5=very relevant

27. What are your main sources of market information for the agricultural enterprise ranked priority number 2 (local market, town market, export) (probe if Cooperative, farmers' group, NAFIS, KACE, Foodnet, market, neighbours)? \_\_\_\_\_

27. Ni vipi vyanzo muhimu vya habari za soko vya miradi ya uzalishaji uliopatia umuhimu nambari 2 hapo awali (soko la nyumbani na soko la nje) (dadisi chama cha ushirika, kikundi cha wakulima NAFIS (National Farmers Information Service), KACE (Kenya Agricultural Commodity Exchange), Foodnet, majirani)?

**E Linkages and channels of communication / Viunganishi na njia za mawasiliano**

28. a. I am going to mention a list of some communication methods used for capturing and sharing local and / or indigenous agricultural knowledge. Please indicate which ones you have had some experience with (for accessing and sharing agricultural knowledge and information)?

28. a. Nitakutajia orodha ya njia za upelekaji wa habari zinazotumika kukamata na kusambaza ujuzi wa kilimo wa kiasili au wa kinyumbani. Tafadhali onyesha ni zipi umeweza kutumia kwa (kupata na kusambaza habari za kilimo na ujuzi wa kiasili au wa kinyumbani)?

Communication methods used to capture and share local or indigenous knowledge / njia za upelekaji wa habari zinazotumika kukamata na kusambaza ujuzi wa kilimo wa kiasili au wa kinyumbani.	Tick as applies	Communication methods used to capture and share local or indigenous knowledge / njia za upelekaji wa habari zinazotumika kukamata na kusambaza ujuzi wa kilimo wa kiasili au wa kinyumbani.	Tick as applies
Drama / michezo ya kuigiza		Radio / redio	
Stories / hadithi		WorldSpace radio	
Song / nyimbo		Television / televisheni	
Artifacts / vinyago		Video	
Meetings or barazas / mikutano au baraza		Telephone (land line) / simu ya ardhi	
Exchange visits / ziara za kubadilishana		Cellular phone / simu ya mkono	
Study tours / safari ya kutazama na kujifunza		Internet / mtandao wa intanet	
Demonstration / maonyesho ya kuonyesha matendo		PDA / compyuta ndogo ya mkononi	
Shows / shoo		Others (specify) / nyingine	
Word of mouth passed on from elders and earlier generations / mawaidha na ujuzi iliotokana na wazee wa kale uliopitishwa kwa mdomo			
Neighbours / majirani			
Print (specify) / chapa (fafanua)			

b. What other communication methods do you use to access or share agricultural information?

b. Unatumia njia gani nyingine za mawasiliano ya habari za kilimo?

c. How effective have each of these communication methods been to you in accessing and / or sharing agricultural knowledge and information? (not effective at all =1 very effective =5)

c. Kwa kila njia au chombo cha uwasiliano ambacho umetumia kupata au kusambaza habari au ujuzi wa kilimo, je kimekufaa kwa njia gani?

(not effective at all / hakikutufaa kamwe =1 / very effective / kilifufaa kikamilifu kabisa =5)

Njia / chombo cha uwasiliano

Communication methods (hakikunifaa kikamilifu kamwe) kilinifaa kikamilifu kabisa

1 _____	1= not effective at all	2	3	4	5=very effective
2 _____	1= not effective at all	2	3	4	5=very effective
3 _____	1= not effective at all	2	3	4	5=very effective
4 _____	1= not effective at all	2	3	4	5=very effective
5 _____	1= not effective at all	2	3	4	5=very effective

d. How much experience do you have with these methods? (very little =1 very much =5).

d. Je una ujuzi kiasi gani kuhusu matumizi ya njia hizo au vyombo hivyo vya uwasiliano? (very little / kidogo sana =1 very much / ujuzi mwingi sana=5)?

Communication methods

Njia / chombo cha uwasiliano

	Kidogo sana				mwingi sana
1 _____	1= very little	2	3	4	5=highly experienced
2 _____	1= very little	2	3	4	5= highly experienced
3 _____	1= very little	2	3	4	5= highly experienced
4 _____	1= very little	2	3	4	5= highly experienced
5 _____	1= very little	2	3	4	5= highly experienced

e. How did these communication methods relate to your main agricultural enterprises?

e. Je, njia hizo au vyombo hivyo vya uwasiliano zilichangia au kusaidia vipi miradi muhimu ya uzalishaji?

29. a. Now I want you to go back to the ICTs you have used. What three ICTs do you prefer to use for accessing agricultural information and knowledge (give an overall ranking in order of preference)?

29. a. Sasa nataka utafakari teknolojia za mawasiliano ya habari ambazo umetumia ili kupata au kusambaza habari za ukulima na ujuzi au elimu ya kiasili au ya kitamaduni. Wewe binafsi unapendelea teknolojia gani tatu muhimu zaidi za mawasiliano ya habari?

1 \_\_\_\_\_

2 \_\_\_\_\_  
3 \_\_\_\_\_

- b. Why do you prefer these ICTs (describe how you have applied the ICTs)? \_\_\_\_\_  
 b. Ni kwa nini unapendelea hizi teknolojia za mawasiliano ya habari (elezea umezitemia vipi teknolojia hizo za mawasiliano ya habari)?  
 c. What feelings do you have in connection with their use? \_\_\_\_\_  
 c. Je una hisia au maoni gani kuhusu matumizi ya teknolojia hizo za mawasiliano ya habari?  
 d. How did these feelings relate to your farming activities? \_\_\_\_\_  
 d. Je hisia au maoni hayo yalichangia vipi kwenye shuguli zako za kilimo?  
 e. How has the use of ICTs impacted on your life in relation to agriculture? \_\_\_\_\_  
 e. Je teknolojia hizi za mawasiliano ya habari zimebadilisha vipi maisha yako kuhusu kilimo?  
 f. What were the outcomes? \_\_\_\_\_  
 f. Je, matumizi ya hizi teknolojia za mawasiliano ya habari zimeleta matokeo gani?  
 30. What barriers or constraints have you experienced using these ICTs? \_\_\_\_\_  
 30. Je umepata vikwazo au vizuizi gani kwenye matumizi ya hizi teknolojia za mawasiliano ya habari?

**F Usage of knowledge and information / Matumizi ya ujuzi na habari za kilimo**

31. a. Do you use external agricultural information in your agricultural practices?  
 31. a. Je wewe hutumia habari za kilimo zitokazo nje kwenye shuguli zako za kilimo? Yes /  
 Ndio ☐ No / No ☐ If no, go to question 32.

- b. If yes, describe how you have used external agricultural information on crop production or pest management or a new technology provided by research or extension or training or other information providers and how you used it? \_\_\_\_\_  
 b. Kama ndio, elezea jinsi ulivyotumia habari za kilimo za nje, kama vile za ukuzaji wa miradi ya uzalishaji au wadudu waharibifu au teknolojia mpya iliyotoka kwenye vituo vya watafiti, au waenezaji wa kilimo au vituo vya mafunzo au kwingineko?  
 c. Why do you use external agricultural information? \_\_\_\_\_  
 c. Kwa nini unatumia habari za kilimo kutoka nje?  
 d. How frequently do you use external agricultural information (probe if weekly, monthly, bi-monthly, three times a year, two times a year, annually, other (specify)?)  
 d. Wewe hutumia habari hizo za kilimo kutoka nje mara ngapi (dadisi kila wiki, kila mwezi, kila miezi miwili, mara tatu kwa mwaka, mara mbili kwa mwaka, mara moja kwa mwaka)?

External information used / Habari za kilimo za kutoka nje	Frequency used / Mara ngapi

- e. How does the external agricultural information relate to your local or indigenous agricultural knowledge? \_\_\_\_\_  
 e. Je habari za kilimo zitokazo nje (kwa watafiti au vituo vingine) zinahusiana vipi na ujuzi wa kiasili au kitamaduni?  
 f. What were your feelings or emotions about mixing local and / or indigenous knowledge and external knowledge? \_\_\_\_\_  
 f. Una hisia gani au maoni gani kuhusu uchanganyaji wa eleme au ujuzi wa kiasili, wa kinyumbani, na habari za kilimo za kutoka nje?  
 g. What constraints / barriers did you encounter in mixing local and / or indigenous agricultural knowledge and external information? \_\_\_\_\_  
 g. Ulipata matatizo au vikwazo au vizuizi gani kwenye kuchanganya ujuzi ya kiasili au ya kinyumbani na habari za kilimo kutoka nje?  
 32. a. Describe a specific instance(s) when you made a major decision / innovation / solved a problem as a result of using some item of agricultural knowledge or / and information (mention the steps you took). -  
 32. a. Simulia au arifia wakati ambao ulifanya uamuzi muhimu / ugunduzi au uvumbuzi / utatuji wa shida / kuzidisha ufahamu baada ya kutumia habari za kilimo au ujuzi / elimu ya kilimo (fafanua kulitokea nini kipindi hicho na ni hatua gani ulichukua).  
 b. What knowledge and / or information helped you to make the decision / innovation / solve a problem / understanding? \_\_\_\_\_  
 b. Ni habari / ujuzi gani ya kilimo yaliyokusaidia kufanya uamuzi / uvumbuzi au ugunduzi / kutatua shida / kuzidisha ufahamu?



c. Were you satisfied with the decision / innovation / problem solved / understanding you made?

c. Je uliridhika na uamuzi uliofanya / ugunduzi au uvumbuzi / utatuzi wa shida / uzidishaji wa ufahamu? Yes / Ndio ☐ No / La ☐ If no, go to question 33.

d. To what extent were you satisfied? / Je uliridhika kiasi gani na uamuzi uliofanya?

1= not satisfied at all 2 3 4 5=highly satisfied  
sikuridhika kamwe niliridhika kabisa

e. Did you have any difficulties arriving at the innovation / solution?

e. Ulipata shida yeyote kufanya uvumbuzi au kupata suluhisho?

Yes / Ndio ☐ No / La ☐ If no, go to i.

f. If yes, what difficulties did you experience in arriving at the innovation / solution?

f. Kama ndio, mlipata shida gani kufanya uvumbuzi au kupata suluhisho? \_\_\_\_\_

g. What needs to be done to improve decision making / innovation / problem solving understanding /? \_\_\_\_\_

g. Una maoni gani au mawaidha gani kuhusu uboreshaji wa kufanya maamuzi / ugunduzi au uvumbuzi / utatuzi wa shida / kuzidisha ufahamu?

33. a. Is the knowledge and information generated and shared by the key actors in the district sufficient for addressing your needs? Yes / Ndio ☐ No / La ☐

33. a. Je ujuzi na habari za kilimo zitokazo kwa washikadau walioko kwenye wilaya yenu zinatoshia mahitaji yako ya ukulima?

b. If no, how do you go about seeking external information and knowledge? \_\_\_\_\_

b. Kama ndio la, eleza unatafuta vipi habari za kilimo na ujuzi kutoka nje ya wilaya.

c. If you had power, what would you like to see in the community (in relation to local, indigenous / external agricultural information and knowledge)? \_\_\_\_\_

c. Kama ungekua na uwezo, ni mbadiliko gani ungefanya kwenye wilaya yenu kuhusu habari na ujuzi ya kilimo za kiasili, kinyumbani na za kutoka nje?

#### G Knowledge management and information management / Usimamizi wa ujuzi na usimamizi wa habari

34. a. Have you ever been involved in the capturing and recording of local or indigenous knowledge you possess (probe if writing, taping, video, audiotape, drama, song, artifact, knowledge base)? Yes / Ndio ☐ No / La ☐

34. a. Je umewahi kuhusika katika shuguli za kunasa na kurekodi ujuzi ya kilimo ya kiasili au ya kinyumbani (dadisi kwa maadishi, utepe, video, michezo ya kuigiza, benki ya ujuzi)?

b. If yes, could you describe the instance (describe the steps you took in recording)?

b. Kama ndio, unaweza kusimulia jinsi ulivyofanya (simulia hatua ulizochukua)?

c. Why did you record the knowledge? \_\_\_\_\_

c. Kwanini ulirekodi ujuzi huo wa kilimo?

d. Did you share the knowledge you recorded with any other person(s)?

d. Je uligawia au kusambazia watu wengine ujuzi huo uliorekodi?

Yes / Ndio ☐ No / La ☐

e. If yes, who did you share the knowledge with? \_\_\_\_\_

e. Kama ndio, uligawia nani au ulisambazia nani ujuzi huo?

f. How did you share the knowledge? \_\_\_\_\_

f. Wewe husambaza vipi ujuzi wa kilimo?

g. Why did you share the knowledge? \_\_\_\_\_

g. Kwa nini ulisambaza ujuzi huo?

h. What challenges or barriers did you encounter in sharing the local and or indigenous knowledge?

h. Ulipata vikwazo au matatizo gani wakati ulipokua ukisambaza elimu au ujuzi wa kiasili au wakinyumbani?

#### H Improved AKIS model

35. Suggest ways through which the different actors, institutions and rural people can improve the sharing of knowledge and information on the agricultural enterprises you mentioned above.

35. Una mashauri gani kuhusu jinsi washikadau mbali mbali, vituo na wanakijiji wanaweza kuimarisha usambazaji wa habari za kilimo na ujuzi wa miradi muhimu ya uzalishaji?

36. Is there anything you want to add or comment on? \_\_\_\_\_

## Appendix 13: Interview guide for key informants

### A General

- Date: \_\_\_\_\_ Code: \_\_\_\_\_
- Name of respondent: \_\_\_\_\_
1. Gender: Male ☐ Female ☐
2. Age bracket: 15-25 ☐ 26-35 ☐ 36-45 ☐ 46-50 ☐ 51-60 ☐ 61-70 ☐ 71-80 ☐ > 80 ☐
3. Position of respondent: \_\_\_\_\_
4. Division: \_\_\_\_\_
5. Location: \_\_\_\_\_
6. Sub-location: \_\_\_\_\_
7. What types of household are there in the community? (Probe for the categories used to differentiate households). \_\_\_\_\_
8. How do households in the community make a living? (Probe for the main source of food and income e.g. farm, market, employment, business). \_\_\_\_\_
- 9a. Are there any differences in the roles of men and women in farming? Yes ☐ No ☐
- b. If yes, what are the differences? \_\_\_\_\_
10. What is the trend regarding the role of young people in farming? (Probe for whether young people are taking up farming (crops and livestock))? \_\_\_\_\_
11. How is the physical environment of the community and the surrounding area changing? \_\_\_\_\_

### B Farming systems and enterprises

12. What are the main farming systems in the community (e.g. rainfed farming, irrigated farming, mixed cropping, monocropping, agroforestry)? \_\_\_\_\_
13. What farming practices are in place (traditional, improved, farming implements used, agro-processing, adoption of new technologies)? \_\_\_\_\_
14. What are the key enterprises in the community (e.g. coffee, tea, horticulture, rice, maize, animals (list))? \_\_\_\_\_
15. Who is involved in the enterprises? (Owner, employee, shareholder, men, women, youth)? \_\_\_\_\_
16. a. Are there different roles for men, women and the youth? Yes ☐ No ☐
- b. If yes, how do the different genders relate to one another? \_\_\_\_\_

### C Farmers' groups

17. a. Are there farmers' groups in the community or district? Yes ☐ No ☐ If no, go to question 20.
- b. If yes, what types of farmers' groups are in place (Probe for membership and gender)? \_\_\_\_\_
- c. How are the farmers' groups organised? \_\_\_\_\_
- d. Which are some of the main farmers' groups, associations and cooperatives in the community? \_\_\_\_\_
- e. How were the groups formed? \_\_\_\_\_
- f. What size are most of the groups? \_\_\_\_\_
- g. Are the groups registered? Yes ☐ No ☐
- h. If yes, in what way are the groups registered? (Probe for where they are registered at local (e.g. with Ministry of Social Services), national (e.g. KESSFA, KENFAP, KNFU), international levels) \_\_\_\_\_
- i. Are the registered (formal) farmers' groups different from the informal farmers' groups? Yes ☐ No ☐
- j. If yes, how are they different? \_\_\_\_\_
- k. Who coordinates the farmers' groups? \_\_\_\_\_
18. What roles do the farmers' groups play in the community or district? (Probe for benefits of groups – how they facilitate sharing of knowledge and information)
19. a. Do farmers' groups face any challenges or constraints? Yes ☐ No ☐
- b. If yes, what are the major challenges or constraints that they face? \_\_\_\_\_

### D Sources of local and / or indigenous<sup>94</sup> knowledge and external information

<sup>94</sup> Indigenous knowledge is the unique knowledge existing within people's memories and developed around specific conditions of women and men indigenous to a particular geographic area. Local knowledge is a blend of knowledge generated locally through practice and experience, and incorporating knowledge from several cultures within individual societies that may not be indigenous to the community in an ecosystem. The people have

20. Where do farmers and other actors obtain agricultural knowledge and information in the district or community (probe for local, indigenous and external knowledge)?

21. What information or knowledge do these sources have?

Source	Type of information
22. a. Do farmers get any information from farmers' groups?	Yes <input type="checkbox"/> No <input type="checkbox"/>
b. If yes, what information do they get? _____	
23. a. Do community members consult extensionists as sources of agricultural related information and knowledge?	Yes <input type="checkbox"/> No <input type="checkbox"/>
b. If yes, what information do they access from extensionists? _____	
24. a. Do community members consult researchers as sources of agricultural related information and knowledge?	Yes <input type="checkbox"/> No <input type="checkbox"/>
b. If yes, what information do they access from researchers? _____	
25. a. Do community members consult NGOs and CBOs as sources of agricultural related information and knowledge?	Yes <input type="checkbox"/> No <input type="checkbox"/>
b. If yes, what information do they access? _____	
26. a. Do community members consult stockists as sources of agricultural related information and knowledge?	Yes <input type="checkbox"/> No <input type="checkbox"/>
b. If yes, what information do they access? _____	
27. a. Do community members consult projects or other development initiatives as sources of agricultural related information and knowledge?	Yes <input type="checkbox"/> No <input type="checkbox"/>
b. If yes, what information do they access? _____	
28. a. Do community members consult religious organisations as sources of agricultural related information and knowledge?	Yes <input type="checkbox"/> No <input type="checkbox"/>
b. If yes, what information do they access? _____	
29. What are the main sources of market information in the community or district? _____	
30. a. Are there agricultural related training courses organised for farmers in the community or district?	Yes <input type="checkbox"/> No <input type="checkbox"/>
b. If yes, who organises these courses? _____	
c. Who attends the training courses? _____	
d. What is taught at these courses? _____	
e. Do farmers adopt what they have learned? _____	
f. How is the knowledge acquired by farmers shared with other group members or other community members? _____	

### **E Linkages and channels of communication**

31. a. Who are the key agricultural actors in the district? (e.g. researchers, extensionists, educators, NGOs, CBOs, stockists, traders, farmers and others)? \_\_\_\_\_

b. How do these actors interact with farmers' groups? \_\_\_\_\_

32. a. Are there associations or networks in the community?

Yes ☐ No ☐

b. If yes, what is the role of these associations or networks? \_\_\_\_\_

c. Who are members of these associations or networks? \_\_\_\_\_

33. How does agricultural information and knowledge flow between researchers, educationists, extension workers and farmers? \_\_\_\_\_

34. What are the main communication media used for accessing and sharing agricultural knowledge and information in the district or community?

Person-to-person ☐ Print ☐ Electronic ☐

35. a. Do the key actors use ICTs<sup>95</sup> to access and share agricultural information and knowledge with other actors (e.g. radio, WorldSpace radio, cellular phone, television, video, internet, others)?

Yes ☐ No ☐ If no, go to question 36.

b. What ICTs are commonly used to share and disseminate knowledge and information (telecentres, rural resource centres – what ICTs (video, cellular phones, hand held devices) are in place, who uses them? \_\_\_\_\_

c. What ICTs do community members prefer to use? \_\_\_\_\_

d. Why do community members prefer these ICTs? \_\_\_\_\_

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settled and resided together for many years and have developed local knowledge in an effort to cope with the ever-changing agri-ecological conditions.

<sup>95</sup> ICTs = Information and Communication Technologies (e.g. internet, cellular phones, SMS, digital cameras, databases, computer, radio, TV, video, cinema)



36. What problems do community members face in accessing and sharing agricultural knowledge and information with other actors? \_\_\_\_\_

**F Usage of information and knowledge**

37. a. Have farmers adopted any new technologies or high value crops or improved farming methods on their farms based on available external information, local and / or indigenous knowledge?

Yes ☐ No ☐ If no, go to question 38.

b. If yes, what are these technologies or improved farming methods? \_\_\_\_\_

c. Where did the farmers obtain the information on these technologies or crops or farming methods? \_\_\_\_\_

d. How did the farmers use the information? \_\_\_\_\_

38. a. Do community members use local and / or indigenous agricultural knowledge in their farming activities (probe whether local or indigenous knowledge)? Yes ☐ No ☐ If no, go to question 39.

b. If yes, what is the local and / or indigenous agricultural knowledge that was used? \_\_\_\_\_

c. Where did the farmers obtain this local and / or indigenous agricultural knowledge from? \_\_\_\_\_

d. How did the farmers use the local and / or indigenous agricultural knowledge? \_\_\_\_\_

**G Knowledge management and information management**

39. a. Can you relate a specific instance when community members recorded (e.g. writing, taping, video, audio-tape, knowledge bases, drama) in the community or district? (Probe for traditional (drama, stories, folklore, knowledge fairs) and modern methods using ICTs (such as computers, video, photographs, websites) local and / or indigenous agricultural knowledge? Yes ☐ No ☐

b. Could you describe the instance? \_\_\_\_\_

c. Why did the community record the knowledge? \_\_\_\_\_

d. What steps did they take in recording the knowledge? \_\_\_\_\_

e. Was the recorded knowledge shared with other community members? Yes ☐ No ☐

g. If yes, how was the knowledge shared? \_\_\_\_\_

h. Who was the knowledge shared with? \_\_\_\_\_

i. How did they use the local and / or indigenous knowledge (probe for whether it was combined with external agricultural information)? \_\_\_\_\_

j. Why did they share the knowledge? \_\_\_\_\_

k. Who keeps the stored knowledge? \_\_\_\_\_

40. a. Can you relate a specific instance when different actors (e.g. extension, research or training) in the community disseminated (e.g. publication, radio programme, television programme, e-mail, internet, data base) external agricultural information? Yes ☐ No ☐

b. Could you describe the instance? \_\_\_\_\_

c. How did the actors disseminate the information? \_\_\_\_\_

d. Where did they get the information from? \_\_\_\_\_

e. How was the information packaged? \_\_\_\_\_

h. Who did the actors share the information with? \_\_\_\_\_

i. Why did they share the information? \_\_\_\_\_

j. How did the community members use the information (probe for whether it was combined with local and / or indigenous knowledge)? \_\_\_\_\_

k. How did the community store the information? \_\_\_\_\_

**H Improved AKIS model**

41. Could you suggest ways through which the creation, sharing and storing of agricultural knowledge and information could be improved in the community or district. \_\_\_\_\_

42. Is there anything you want to add or comment on? \_\_\_\_\_

Contact address

Postal address	
Telephone / Fax	
E-mail	

## Appendix 14: Interview guide for government ministries and parastatals, research, education and training institutions

### A General

- Date: \_\_\_\_\_ Code: \_\_\_\_\_
- Name of respondent: \_\_\_\_\_ 1. Gender: Male ☐ Female ☐
2. Age: 15-25 ☐ 26-35 ☐ 36-45 ☐ 46-50 ☐
- 51-60 ☐ 61-70 ☐ 71-80 ☐ > 80 ☐
3. Position of respondent: \_\_\_\_\_ 4. Division: \_\_\_\_\_
5. Location: \_\_\_\_\_ 6. Sub-location: \_\_\_\_\_
7. What physical area(s) do you cover in the district?

Whole district	Yes <input type="checkbox"/> No <input type="checkbox"/>
Division(s) <i>specify</i>	Yes <input type="checkbox"/> No <input type="checkbox"/>
Location(s) <i>specify</i>	Yes <input type="checkbox"/> No <input type="checkbox"/>
Sub-location(s) <i>(specify)</i>	Yes <input type="checkbox"/> No <input type="checkbox"/>
Village(s) <i>(specify)</i>	Yes <input type="checkbox"/> No <input type="checkbox"/>

8. What are the main objectives of your ministry / institute regarding support to small-scale farmers in Kirinyaga district? (probe for the key activities of the institution in relation to small-scale farmers).

9. What are the primary agricultural activities that your institution is involved in? (list them in order of importance and probe for knowledge and information related activities)

Activity Rank

### B Information behaviour

10. Where do you obtain agricultural information and knowledge to meet your ministry's/institute's objectives?

11. What information do you need to fulfil your primary agricultural activities? \_\_\_\_\_

12. How do you go about searching for information that you need to fulfil these needs?

13. a. Do you use information and or knowledge from other providers and actors (research, education, training, farmer groups, farmers)? (probe for small-scale farmers / farmers groups) Yes ☐ No ☐  
if no, go to question 14.

b. If yes, what information do you use and from the main actor(s) (probe for researchers, education and training institutions, farmers, farmers groups, NGOs)?

Actor Information used

c. What knowledge do you use and from the main actor(s) (probe for researchers, farmers, neighbours, elders, community experts, visitors)?

Actor knowledge used

d. Suggest ways to improve access to agricultural information that is timely and relevant to your needs.

14. a. What new farming practice or technology or enterprise do small-scale farmers favour?

b. Why do you think that the farmers favour this new technology / farming practice / enterprise?

### C Sources of local and or / indigenous agricultural knowledge and external information

15. What knowledge and information resources does your institution possess? \_\_\_\_\_

16. Who are the main users of the information and knowledge that your institution? produces / possesses? (probe for farmer groups if not mentioned)

User Type of information

### D Linkages and channels of communication

17a. Who are the primary agricultural actors that you collaborate with in the district? (tick as appropriate)

Primary actors	Tick	Primary actors	Tick
Researchers		Farmers' groups	
Extensionists		Agricultural cooperatives	

Education institutions		Agricultural associations	
Training institutions		Agricultural networks	
Research institutions		Media (specify)	
Regional organisations		Others (specify)	
International organisations			
NGOs			
CBOs			
Input stockists			
Traders			
Agro-processors			

b. What major barriers or constraints do you experience with these actors? \_\_\_\_\_

c. How have you attempted to bridge the barriers or constraints mentioned in b? \_\_\_\_\_

d. What was the outcome of your interventions in addressing the barriers or constraints? \_\_\_\_\_

e. If you had the power, what would you change to improve linkages between your Ministry / institution with other actors? \_\_\_\_\_

18. How do you disseminate agricultural information and knowledge to farmers in the district / community? \_\_\_\_\_

19 I am going to mention a list of some communication methods used for capturing and sharing local and / or indigenous agricultural knowledge. Please indicate which ones your group has had used (for accessing or sharing local and / or indigenous agricultural knowledge and information)? (probe for other communication methods not on list).

Communication methods used to capture and agricultural information.	Tick as applies	Communication methods used to capture and share agricultural information	Tick as applies
Meetings or barazas		Cinema	
Demonstrations		Telephone (land line)	
Shows		Cellular phone	
Handbooks		Internet	
Brochures		PDA	
Posters		Others (specify)	
Radio			
WorldSpace radio			
Television			
Video			

20. a. Do you use ICTs to collect, process, and store agricultural information?

Yes ☐ No ☐ If no, go to question 21.

b. If yes, how are the ICTs used and how often are they used?

ICT \_\_\_\_\_ How it is used \_\_\_\_\_ Frequency of use (daily, weekly, monthly) \_\_\_\_\_

c. Do you use ICTs to share agricultural information? Yes ☐ No ☐ If no, go to question 21.

d. If yes, how are the ICTs used and how often are they used?

ICT \_\_\_\_\_ How it is used \_\_\_\_\_ Frequency of use (daily, weekly, monthly) \_\_\_\_\_

21 a. Do you use ICTs to capture and document local and / or indigenous agricultural knowledge?

Yes ☐ No ☐ If no, go to question 22.

b. If yes, how are the ICTs used to capture and document local and / or indigenous agricultural knowledge, and how often are they used?

ICT \_\_\_\_\_ How it is used \_\_\_\_\_ Frequency of use (daily, weekly, monthly) \_\_\_\_\_

c. Do you use ICTs to share local and / or indigenous agricultural knowledge with other actors (e.g. research, education, training, farmer groups, farmers) (radio, WorldSpace radio, cellular phone, TV, video, internet, others)? Yes ☐ No ☐ If no, go to question 22.

d. If yes, how are the ICTs used and how often are they used to share local and / or indigenous agricultural knowledge?

ICT \_\_\_\_\_ How it is used \_\_\_\_\_ Frequency of use (daily, weekly, monthly) \_\_\_\_\_

22. a. Do you use ICTs to process agricultural information and knowledge specifically with small-scale farmers? (radio, WorldSpace radio, cellular phone, television, video, internet, others)

Yes ☐ No ☐ If no, go to question 23.

b. If yes, how are the ICTs used and how often are they used?

ICT	How it is used	Frequency of use (daily, weekly, monthly)
23. What three ICTs do you prefer to use most and why?		
ICT preferred	Why it is preferred	
1 _____	_____	
2 _____	_____	
3 _____	_____	
24. What arrangements are in place for wider collaboration in sharing and disseminating agricultural knowledge and information among actors (e.g. research, education, training, farmer groups, mass media)?		
_____		

**E Usage of knowledge and information**

- 25a. Can you narrate an example where your institution used agricultural information and / or knowledge in the community or district? \_\_\_\_\_
- b. How was the information acquired? \_\_\_\_\_
- c. How was the information disseminated to users (e.g. meeting, demonstration, show, print, database, telecentre, information centre, radio, television, database, cellular phone)? \_\_\_\_\_
- d. How was the information used or applied? \_\_\_\_\_
- e. What was the outcome of applying the information? \_\_\_\_\_

**F Knowledge management and information management**

26. a. In addition to your answers to questions 21 and 22 above (how ICTs are used to collect, process, store and disseminate information), how else do you repackage agricultural information for smallscale farmers (probe for demonstrations, shows, and print)?
- b. In what format is the content repackaged? \_\_\_\_\_
- c. In what language is the content repackaged?
- | Content repackaged | Format | Language |
|--------------------|--------|----------|
| _____              | _____  | _____    |
- d. Looking back on any occasion when you repackaged content, describe the steps you took in repackaging agricultural information. \_\_\_\_\_
- e. What set of actors were involved in the process of repackaging content, and what were their roles (e.g. research, education, training, farmer groups, farmers, networks)? \_\_\_\_\_
27. Is there anything you want to add or comment on? \_\_\_\_\_

Contact address

Postal address	_____
Telephone / Fax	_____
E-mail	_____
	_____

**Appendix 15: Interview guide for NGOs, CBOs, projects and religious organisations**

**A General**

- Date: \_\_\_\_\_ Code: \_\_\_\_\_
- Name: \_\_\_\_\_ Position: \_\_\_\_\_
1. Gender: Male ☐ Female ☐
2. Age: 15-25 ☐ 26-35 ☐ 36-45 ☐ 46-50 ☐
- 51-60 ☐ 61-70 ☐ 71-80 ☐ > 80 ☐
3. Name of institution: \_\_\_\_\_
4. Type of institution: NGO ☐ CBO ☐ Project ☐ Other ☐ (specify) \_\_\_\_\_
5. Division: \_\_\_\_\_ 6. Location: \_\_\_\_\_
7. Sub-location: \_\_\_\_\_
8. Farmers you are working with: Male ☐ Female ☐ Youth ☐ Mixed ☐

**B Institution / project background**

9. What are the key objectives of your institution / project? \_\_\_\_\_
10. a. Is your institution / project involved in any agricultural activities? Yes ☐ No ☐
- b. If yes, what are the main activities you are involved in? \_\_\_\_\_
- c. Could you rank the activities in order of importance? \_\_\_\_\_

No.	Activity
-----	----------

1	
2	
3	
4	
5	

11. a. What are the main enterprises in the farms of the community you serve? \_\_\_\_\_  
b. What are the main enterprises that your institution / project deals with? \_\_\_\_\_  
c. Why did you get involved in these enterprises? \_\_\_\_\_  
d. Could you list the enterprises in the categories provided and give an overall ranking in order of priority (with one being the most important)?

No.	Enterprise	Cash	Subsistence	Other
1				
2				
3				
4				
5				

12. a. Does your institution / project work with farmers' groups? Yes ☐ No ☐  
b. If yes, what farmers' groups are you working with? \_\_\_\_\_  
c. How were members of the groups identified? \_\_\_\_\_  
d. What is the size of the farmers' groups (Probe for how many members are in a group)? \_\_\_\_\_  
e. How is the group(s) structured? (Probe for committee, composition and gender) \_\_\_\_\_  
13. Are the groups you are working with registered? Yes ☐ No ☐

### C Information behaviour

14. What information and knowledge does your institution / project need to fulfil your primary activities?

15. How do you go about searching for information to fulfil these needs? \_\_\_\_\_

16. Who collects the information and knowledge required? \_\_\_\_\_

17. a. Does your institution / project use information and or knowledge from other agricultural actors (e.g. research, education, training, small-scale farmers, farmers' groups) Yes ☐ No ☐ b. If yes, what knowledge / information do you use and from which actor(s)?

Actor	Information / knowledge used
_____	_____

- c. How does your institution / project use this knowledge / information? \_\_\_\_\_  
d. Are you satisfied with the information and knowledge you get? Yes ☐ No ☐  
e. To what extent are you satisfied?  
1= not satisfied at all      2      3      4      5=highly satisfied  
f. Where do you find additional information and knowledge you require? \_\_\_\_\_  
18. a. Does your institution share the information accessed with the community? Yes ☐ No ☐  
b. If yes, with whom do you share the information (Probe for whether they share with farmers' groups, extension, research, farmers)? \_\_\_\_\_  
19. a. Does your institution / project need any particular kinds of information or advice or training on any agricultural activities that you would like to introduce or improve but does not have enough information?  
Yes ☐ No ☐  
b. If yes, specify the particular information, advice or training desired. \_\_\_\_\_  
c. What are the reasons for not having enough information and knowledge? \_\_\_\_\_  
d. Has your institution / project tried to get this information, advice or training?  
Yes ☐ No ☐  
e. If yes, what happened? / If not, why have you not tried to get it? \_\_\_\_\_  
20. What barriers and constraints do you encounter in accessing and sharing agricultural knowledge and information? \_\_\_\_\_

### D Sources of local and / or indigenous knowledge and external information

21. What are your institution's / project's main sources of agricultural knowledge and information?

22. a. Does your institution / project have agricultural knowledge and information resources (probe for presence of a resource centre, library, information centre)? Yes ☐ No ☐  
b. If yes, what types of information or knowledge do you have? \_\_\_\_\_  
c. Who are the main users of this information and knowledge?  
User      d. Information and knowledge used  
\_\_\_\_\_

**E Linkages and channels of communication**

23. What relationship does your institution / project have with other partners, networks, interest groups, and institutions in the community as regards improving agricultural activities (probe for collaboration and how they work together in synergy)? \_\_\_\_\_

24. What relationship does your institution / project have with other partners, networks, interest groups and institutions outside the community as regards improving agricultural activities (probe for use of external agricultural information, advice, training)? \_\_\_\_\_

25. How does agricultural information and knowledge flow between research, extension and education in the community? \_\_\_\_\_

26. What method(s) do you use for disseminating agricultural information and knowledge? \_\_\_\_\_

27. What communication media does your institution / project use for accessing and sharing agricultural knowledge and information with other actors (e.g. research, education, training, farmers' groups, farmers) in the district?

Person-to-person ☐ Print ☐ Electronic ☐

28. a. Does your institution / project use ICTs to collect, process and disseminate agricultural information with other actors (e.g. research, education, training, farmers' groups, farmers) (radio, WorldSpace radio, cellular phone, TV, video, internet, others) Yes ☐ No ☐

b. If yes, how are the ICTs used and how often are they used?

ICT

How it is used

Frequency of use

29. a. Does your institution / project use ICTs to capture and share local and / or indigenous agricultural knowledge with other groups and individuals in the community (e.g. research, education, training, farmers' groups, farmers) (radio, WorldSpace radio, cellular phone, TV, video, internet, others)?

Yes ☐ No ☐

b. If yes, how are the ICTs used to capture and share local and / or indigenous knowledge and how frequently are they used?

ICT

How it is used

Frequency of use

30. What ICTs does your institution / project prefer to use and why?

ICT

Why it is preferred

**F Knowledge management and information management**

31. How is new knowledge created or produced in the community? \_\_\_\_\_

32. a. Narrate an example where new knowledge was created and applied or a new idea was tried (innovation) in the community. \_\_\_\_\_

b. What were the innovation / new idea? \_\_\_\_\_

c. Who was responsible for the innovation / new idea? \_\_\_\_\_

d. How was information about this innovation / new idea acquired? \_\_\_\_\_

e. How was the knowledge applied? \_\_\_\_\_

f. What was the outcome of the application of knowledge? \_\_\_\_\_

g. How was the knowledge shared with other members of the community (probe if the new knowledge was documented and stored)? \_\_\_\_\_

33. a. Do you repackage agricultural content specifically for small-scale farmers?

Yes ☐ No ☐

b. If yes, narrate an incident where your institution repackaged external agricultural information for farmers? \_\_\_\_\_

c. Who is responsible for repackaging the external information for farmers? \_\_\_\_\_

d. How was the external information collected? \_\_\_\_\_

e. How was the information repackaged (describe the steps taken in repackaging, what format, what language)? \_\_\_\_\_

f. How was the information stored? \_\_\_\_\_

g. How was the information disseminated to farmers? \_\_\_\_\_

h. How was the information used by farmers? \_\_\_\_\_

i. What was the outcome of applying the information? \_\_\_\_\_

**G Improved AKIS model**

34. Could you suggest ways to improve access and sharing of local and / or indigenous agricultural knowledge and information in the community? \_\_\_\_\_

35. Is there anything you want to add or comment on? \_\_\_\_\_

Contact address

Postal address	
Telephone	
E-mail	

## Appendix 16: Interview guide for input stockists (agrovets)

### A General

- Date: \_\_\_\_\_ Code: \_\_\_\_\_
- Name of respondent: \_\_\_\_\_ 1. Gender: Male ☐ Female ☐
2. Age bracket: \_\_\_\_\_
- 15-25 ☐ 26-35 ☐ 36-45 ☐ 46-50 ☐
- 51-60 ☐ 61-70 ☐ 71-80 ☐ > 80 ☐
3. Type of business: Trader ☐ Stockist ☐ 4. Division: \_\_\_\_\_
5. Location: \_\_\_\_\_ 6. Sub-location: \_\_\_\_\_
7. Village/market centre: \_\_\_\_\_

### B Business's background

8. What are the main objectives of your business? (Probe for the key activities of the trader / stockist in relation to small-scale farmers) \_\_\_\_\_
9. a. What farm inputs do you normally stock? / What farm produce do you normally buy or sell? \_\_\_\_\_
- b. What was it that led you to decide on these inputs / products? \_\_\_\_\_

### C Information behaviour

10. What agricultural information and knowledge do you need for the farm inputs / produce? \_\_\_\_\_
11. How do you go about seeking for information and knowledge for the farm inputs / produce? \_\_\_\_\_
12. a. Do you share the external agriculture-related information that you access? Yes ☐ No ☐
- b. If yes, with whom do you share the agriculture-related information that you access? \_\_\_\_\_
- c. How do you share this information? \_\_\_\_\_
- d. Why do you do that? \_\_\_\_\_
- e. What barriers or constraints do you encounter in the sharing of information? \_\_\_\_\_
- f. How do these barriers or constraints affect your activities pertaining to the key items identified above? (spell out the key items identified by the informant above pertaining to barriers or constraints in accessing external information) \_\_\_\_\_
13. a. Do you need any particular kinds of information or advice or training on any inputs / produce you would like to buy and sell, but do not have enough information about? Yes ☐ No ☐
- b. What are the reasons for not having enough information and knowledge? \_\_\_\_\_
- c. What information, advice or training do you need? \_\_\_\_\_
- d. Have you tried to get this information, advice or training? Yes ☐ No ☐
- e. If yes, what happened? If not, why have you not tried to get it? \_\_\_\_\_
- f. How did this affect your business activities pertaining to the key items identified above? \_\_\_\_\_
- g. What were the outcomes of the information, training or advice you received / did not receive? \_\_\_\_\_

### D Sources of knowledge and information

14. a. What are your main sources of information and knowledge for the stocks and products? \_\_\_\_\_
- b. What information do you get from the sources mentioned above?
- | Source | Type of information |
|--------|---------------------|
| _____  | _____               |

**E Channels of communication**

15. a. What communication media do you use for sharing agricultural knowledge and information with farmers? Person-to-person ☐ Print ☐ Electronic ☐ Other (specify) ☐ \_\_\_\_\_  
b. Why do you use this (these) communication media? \_\_\_\_\_
16. a. Do you use ICTs to share and exchange information and knowledge with farmers and researchers, extensionists and other partners in your community (e.g. radio, WorldSpace radio, cellular phone, television, video, e-mail, internet, others)? Yes ☐ No ☐  
b. If yes, how are the ICTs used? \_\_\_\_\_
17. a. What ICTs do you prefer to use to share and exchange information and knowledge with farmers?  
\_\_\_\_\_  
b. Why it is preferred? \_\_\_\_\_

**F Usage of knowledge and information**

18. How do you decide on what inputs to stock / what farm produce to buy and sell? \_\_\_\_\_
19. a. Is the knowledge and information generated and shared by the key agricultural partners (extension, research, education, private sector) in the district sufficient for addressing your information needs? Yes ☐ No ☐  
b. If no, how do you go about seeking external information? \_\_\_\_\_  
c. What do you suggest could be done to improve access to agricultural information and knowledge that address your needs? \_\_\_\_\_

**G Local or indigenous knowledge management and information management**

20. a. Could you relate a specific instance when you shared local agricultural knowledge with any other person? Yes ☐ No ☐  
b. If yes, who did you share the knowledge with? \_\_\_\_\_  
c. How did you share the knowledge? \_\_\_\_\_  
d. Why did you share the knowledge? \_\_\_\_\_
21. a. Could you relate a specific instance when you disseminated (e.g. word of mouth, demonstration, visit to farmer's farm, publication, e-mail, telephone, other - specify) external agricultural information on farm inputs or produce you buy and sell? Yes ☐ No ☐  
b. If yes, who did you share the information with? \_\_\_\_\_  
c. How did you share the knowledge? \_\_\_\_\_  
d. Why did you share the information? \_\_\_\_\_
22. a. When external agricultural information on crop production or pest management or a new seed variety or a new market opportunity is provided by research or extension or training or private sector, how do you use it?  
\_\_\_\_\_  
b. Do you combine external agricultural information and local or indigenous knowledge? Yes ☐ No ☐  
c. If yes, how do you combine the external information and local or indigenous knowledge you possess? \_\_\_\_\_  
d. Why do you combine external information and local or indigenous knowledge? \_\_\_\_\_

**H Improved AKIS model**

23. Could you suggest ways to improve the way through which knowledge and information on agricultural farm inputs / produce you buy and sell could reach community members? \_\_\_\_\_
24. Is there anything you want to add or comment on? \_\_\_\_\_

Contact address

Postal address	
Telephone	
E-mail	



## Appendix 17: Observation checklist

Date: \_\_\_\_\_

Code: \_\_\_\_\_

1. Division: \_\_\_\_\_

2. Location: \_\_\_\_\_

3. Sub-location: \_\_\_\_\_

### A. Site and agro-ecological conditions in a particular sub-location

1. What type of vegetation is there?
2. What farming practices are in place (traditional, improved, farming implements used)?
3. What are the main farming systems (crops grown, high value crops grown, animals – local or exotic breeds, cropping systems)?
4. What are the key enterprises in the community?
5. Who is involved in the production of the enterprises (men, women, youth)?
6. What farming activities are men, women and the youth involved in?
7. What do farmers buy and sell (farm produce, processed goods, agricultural inputs)?
8. Where do people buy what they need (farm produce, processed goods, agricultural inputs)?
9. Where do they sell their produce (farm gate, local market, larger town markets, foreign markets)?

### B. Farmers' groups

1. What types of farmers' groups are there in the community?
2. Are farming practices and enterprises of farmers belonging to groups different from those of farmers that do not belong to farmers' groups?
3. How do farmers belonging to farmers' group market their produce?

### C. Linkages and communication channels

1. Who can be seen as the key actors?
2. How do the different actors interact with each other?
3. How do members in a farmers' group interact with each other?
4. What are the main communication methods used for capturing and sharing local or indigenous agricultural knowledge?
5. What ICTs are commonly used to share and disseminate knowledge and information (look out for telecentres, rural resource centres, information centres – what ICTs are in place (e.g. video, cellular phones, personal digital assistants (PDAs) e.g. handheld personal computers or palm held devices) and who uses them?

### D. Usage of knowledge and information

1. Do farmers use the available agricultural information and knowledge?

### E. Management of local or indigenous agricultural knowledge and information management

1. Is there evidence or recorded agricultural knowledge in the community (any documents, artefacts, paintings, carvings, audio tapes, video, knowledge bases)?
2. What content or messages are contained in these records?
3. Where are these records stored?
4. Is there evidence of external information resources from actors inside and outside the district (publications, repackaged documents, radio programmes, audio tapes, video tapes, databases)?
5. How have community members captured local or indigenous agricultural knowledge and information?
6. How have community members stored information resources?

## Appendix 18: Data collection plan / itinerary

Date	Description	Outcomes
8 Jul 2008	Make courtesy call to DC's office, DEO, and DAO's office. Brief the DAO on study and assistance required.	Research authorization at district level obtained. Logistical support and planning assistance discussed.
9 – 11 Jul 2008	Visit the four divisions in the district and meet the divisional staff and introduce study (Mwea, Gichugu, Central and Ndia).	Familiarization with study area, identification of research assistants and selection of study locations / sub-locations. Sampling frame of farmers' group developed and interviews conducted at district headquarters.
<b>Two weeks in each division for PRA, interviews, observation, focus group discussions</b>		
14-15 Jul 08	Select farmers' groups in Mwea division, arrange logistics and carry out training.	Farmers' groups selected and training of research assistants in Mwea conducted
16 –26 Jul	Mwea data collection (interviews, focus group discussions, PRA, observation)	Data collected
28 Jul 08	Training in Ndia division	Training conducted
28 Jul - 8 Aug	Ndia data collection (interviews, focus group discussions, PRA, observation)	Data collected
11 Aug 08	Training in Gichugu division	Training conducted
11 - 22 Aug	Gichugu data collection (interviews, focus group discussions, PRA, observation)	Data collected
1 Sep 08	Training in Central division	Training conducted
2 Sep-12 Sep 08	Central data collection (interviews, focus group discussions, PRA, observation)	Data collected
<b>15 – 25 Sep 08</b>	<b>Data collection using RAAKS tools</b>	
15-16 Sep 08	RAAKS in Central Division	
17-18 Sep 08	RAAKS in Mwea Division	
19 Sep 08	Filling gaps (Equity Bank; CCS, AFC, SACCO)	
22-23 Sep 08	RAAKS in Ndia Division	
24-25 Sep 08	RAAKS in Gichugu Division	
26 Sep 08	Kamweti ATC (Wrapping up with the DAO)	
October	Data collection in Nairobi	

**Appendix 19: Divisions, locations, sub-locations and number of farmers' groups selected**  
N=90

Division	Number of groups	Location	Number of groups	Sub-location	Number of groups
Central	22	Koroma	10		2
				Ngani	3
				Nduine	5
		Inoi	4	Thaita	1
				Ndimi	1
				Mbeti	2
		Mutira	7	Kagumo	1
				Kabari	4
				Kaguyu	2
Gichugu	26	Karumandi	10	Thumaita	4
				Kariru	3
				Guama	3
		Ngariama	11	Kabari	3
				Nyangeni	3
				Rungeto	5
		Baragwi	6	Thimu	1
				Gatu	1
				Raimu	4
Mwea	26	Murinduko	10	Riagiceru	4
				Miuu	3
				Kamunyange	3
		Kangai	8	Gathiga	4
				Kombuini	2
				Mathiga	2
		Muthithi ln	8	Rukanga	4
				Kiandegwa	2
				Kinyaga	2
Ndia	16	Mwirua location	5	Kithumbu	1
				Kianjag'a	2
				Gitaku	2
		Kiine location	6	Kibingoti	1
				Kiangai	3
				Ruiru	2
		Kariti location	5	Sagana	3
				Gacharu	0
				Mukui	2
Total	90		90		90

**Appendix 20: Divisions, locations, sub-locations and number of farmers belonging to a group**  
N=102

Division	Number of farmers	Location	Number of farmers	Sub-location	Number of farmers
Central	20 (19.61%)	Koroma	8 (7.84%)	Karia	3 (2.94%)
				Ngani	3 (2.94%)
				Nduine	2 (1.96%)
		Inoi	7 (6.86%)	Thaita	1 (0.98%)
				Ndimi	2 (1.96%)
				Kariko	4 (3.92%)
		Mutira	5 (4.90%)	Kagumo	1 (0.98%)
				Kabari	1 (0.98%)
				Kaguyu	3 (2.94%)
Gichugu	26 (25.49%)	Karumandi	9 (8.82%)	Thumaita	3 (2.94%)
				Kariru	3 (2.94%)
				Guama	4 (3.92%)
		Ngariama	9 (8.82%)	Kabari	3 (2.94%)
				Nyangeni	2 (1.96%)
				Rungeto	4 (3.92%)
		Baragwi	8 (7.84%)	Thimu	2 (1.96%)
				Gatu	1 (0.98%)
				Raimu	5 (4.90%)
Mwea	32 (31.37%)	Murinduko	14 (13.73%)	Riagiceru	6 (5.88%)
				Miuu	4 (3.92%)
				Kamunyange	4 (3.92%)
		Kangai	10 (9.80%)	Gathiga	4 (3.92%)
				Kombuini	2 (1.96%)
				Mathiga	4 (3.92%)
		Muthithi	8 (7.84%)	Rukanga	2 (1.96%)
				Kiandegwa	3 (2.94%)
				Kinyaga	3 (2.94%)
Ndia	24 (23.53%)	Mwirua	9 (8.82%)	Kithumbu	3 (2.94%)
				Kianjag'a	3 (2.94%)
				Gitaku	3 (2.94%)
		Kiine	8 (7.84%)	Kibingoti	1 (0.98%)
				Kiangai	3 (2.94%)
				Ruiru	4 (3.92%)
		Kariti	7 (6.86%)	Sagana	3 (2.94%)
				Gacharu	2 (1.96%)
				Mukui	2 (1.96%)
Total	102 (100%)		102 (100%)		102 (100%)

**Appendix 21: Divisions, locations, sub-locations and number of farmers not belonging to a group**  
N=71

Division	Number of farmers	Location	Number of farmers	Sub-location	Number of farmers
Central	17 (23.9%)	Koroma	5 (7.04%)	Karia	2 (2.82%)
				Ngani	1 (1.41%)
				Nduine	2 (2.82%)
		Inoi	7 (9.86%)	Thaita	3 (4.23%)
				Ndimi	2 (2.82%)
				Kariko	2 (2.82%)
		Mutira	5 (7.04%)	Kagumo	1 (1.41%)
				Kabari	2 (2.82%)
				Kaguyu	2 (2.82%)
Gichugu	25 (35.2%)	Karumandi	10(14.08%)	Thumaita	5 (7.04%)
				Kariru	3 (4.23%)
				Guama	2 (2.82%)
		Ngariama	9 (12.68%)	Kabari	3 (4.23%)
				Nyangeni	3 (4.23%)
				Rungeto	3 (4.23%)
		Baragwi	6 (8.45%)	Thimu	2 (2.82%)
				Gatu	1 (1.41%)
				Raimu	3 (4.23%)
Mwea	12 (16.9%)	Murinduko	3 (4.23%)	Riagiceru	1 (1.41%)
				Miuu	1 (1.41%)
				Kamunyang'e	1 (1.41%)
		Kangai	4 (5.63%)	Gathiga	2 (2.82%)
				Kombuini	1 (1.41%)
				Mathigaini	1 (1.41%)
		Muthithi	5 (7.04%)	Rukanga	2 (2.82%)
				Kiandegwa	1 (1.41%)
				Kinyaga	2 (2.82%)
Ndia	17 (23.9%)	Mwirua	6 (8.45%)	Kithumbu	2 (2.82%)
				Kianjag'a	1 (1.41%)
				Gitaku	3 (4.23%)
		Kiine	6 (8.45%)	Kibingoti	2 (2.82%)
				Kiangai	2 (2.82%)
				Ruiru	2 (2.82%)
		Kariti	5 (7.04%)	Sagana	3 (4.23%)
				Gacharu	0 (0%)
				Mukui	2 (2.82%)
Total	71(100%)		71(100%)		71(100%)

## Appendix 22: Type of group farmers belonged to and age categories by division

N=90

Division	Age category	Type of Group				District
		Male only	Female only	Youth	Mixed	
Central	15-25	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)
	26-35	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)
	36-45	1 (5.0%)	4 (20.0%)	0 (0%)	1 (5.0%)	6 (30%)
	46-50	1 (5.0%)	1 (5.0%)	0 (0%)	3 (15%)	5 (25%)
	51-60	2 (10%)	0 (0%)	0 (0%)	2 (10%)	4 (20%)
	61-70	1 (5.0%)	1 (5.0%)	0 (0%)	1 (5.0%)	3 (15%)
	71-80	1 (5.0%)	0 (0%)	0 (0%)	0 (0%)	1 (5.0%)
	>80	0 (0%)	0 (0%)	0 (0%)	1 (5.0%)	1 (5.0%)
	Total	6 (30%)	6 (30%)	0 (0%)	8 (40%)	20 (100%)
Gichugu	15-25	0 (0%)	0 (0%)	0 (0%)	1 (3.8%)	1 (3.8%)
	26-35	0 (0%)	1 (3.8%)	0 (0%)	8 (30.8%)	9 (34.6%)
	36-45	1 (3.8%)	2 (7.7%)	0 (0%)	6 (23.1%)	9 (34.6%)
	46-50	0 (0%)	1 (3.8%)	0 (0%)	2 (7.7%)	3 (11.5%)
	51-60	0 (0%)	0 (0%)	0 (0%)	2 (7.7%)	2 (7.7%)
	61-70	0 (0%)	1 (3.8%)	0 (0%)	1 (3.8%)	2 (7.7%)
	Total	1 (3.8%)	5 (19.2%)	0 (0%)	20 (76.9%)	26 (100%)
Mwea	15-25	0 (0%)	0 (0%)	1 (3.1%)	0 (0%)	1 (3.1%)
	26-35	2 (6.3%)	2 (6.3%)	1 (3.1%)	6 (18.8%)	11 (34.4%)
	36-45	1 (3.1%)	1 (3.1%)	0 (0%)	5 (15.6%)	7 (21.9%)
	46-50	0 (0%)	0 (0%)	0 (0%)	7 (21.9%)	7 (21.9%)
	51-60	0 (0%)	0 (0%)	0 (0%)	2 (6.3%)	2 (6.3%)
	61-70	0 (0%)	0 (0%)	0 (0%)	3 (9.4%)	3 (9.4%)
	71-80	0 (0%)	0 (0%)	0 (0%)	1 (3.1%)	1 (3.1%)
	Total	3 (9.4%)	3 (9.4%)	2 (6.3%)	24 (75.0%)	32 (100%)
Ndia	15-25	0 (0%)	0 (0%)	0 (0%)	1 (4.3%)	1 (4.3%)
	26-35	0 (0%)	0 (0%)	0 (0%)	5 (21.7%)	5 (21.7%)
	36-45	1 (4.3%)	0 (0%)	0 (0%)	5 (21.7%)	6 (26.1%)
	46-50	0 (0%)	0 (0%)	0 (0%)	3 (13.0%)	3 (13.0%)
	51-60	0 (0%)	1 (4.3%)	0 (0%)	3 (13.0%)	4 (17.4%)
	61-70	0 (0%)	3 (13.0%)	0 (0%)	1 (4.3%)	4 (17.4%)
	71-80	1 (4.3%)	4 (17.4%)	0 (0%)	18 (78.3%)	23 (100%)
	Total	1 (4.3%)	4 (17.4%)	0 (0%)	18 (78.3%)	23 (100%)

### Appendix 23: Age categories of informants not belonging to a farmers' group by division

N=71

Division	Age ranges							Kirinyaga
	15-25	26-35	36-45	46-50	51-60	61-70	71-80	
Central	0 (0%)	5 (7%)	2 (2.8%)	1 (1.4%)	3 (4.2%)	5 (7.0%)	1 (1.4%)	17 (23.9%)
Gichugu	3 (4.2%)	7 (9.9%)	6 (8.5%)	6 (8.5%)	3 (4.2%)	0 (0%)	0 (0%)	25 (35.2%)
Mwea	0 (0%)	2 (2.8%)	5 (7.0%)	4 (5.6%)	1 (1.4%)	0 (0%)	0 (0%)	12 (16.9%)
Ndia	1 (1.4%)	3 (4.2%)	6 (8.5%)	2 (2.8%)	2 (2.8%)	1 (1.4%)	2 (2.8%)	17 (23.9%)
Total	4 (5.6%)	17 (23.9%)	19 (26.8%)	13 (18.3%)	9 (12.7%)	6 (8.5%)	3 (4.2%)	71 (100%)

### Appendix 24: Household headship of small-scale farmers by division in Kirinyaga district

N=102 farmers belonging to a farmers' group, N=71 farmers not belonging to a farmers' group

Gender			Division				District
			Central	Gichugu	Mwea	Ndia	Kirinyaga
Small-scale farmers belonging to a group							
Male	Head of household?	Yes	12 (19.7%)	17 (27.9%)	16 (26.2%)	12 (19.7%)	57 (93.4%)
		No	1 (1.6%)	1 (1.6%)	1 (1.6%)	1 (1.6%)	4 (6.6%)
	Total		13 (21.3%)	18 (29.5%)	17 (27.9%)	13 (21.3%)	61 (100%)
Female	Head of household?	Yes	4 (9.8%)	5 (12.2%)	5 (12.2%)	4 (9.8%)	18 (43.9%)
		No	3 (7.3%)	3 (7.3%)	10 (24.4%)	7 (17.1%)	23 (56.1%)
	Total		7 (17.1%)	8 (19.5%)	15 (36.6%)	11 (26.8%)	41 (100%)
Small-scale farmers not belonging to a group							
Male	Head of household?	Yes	10 (23.3%)	15 (34.9%)	3 (7.0%)	10 (23.3%)	38 (88.4%)
		No	0 (0%)	4 (9.3%)	1 (2.3%)	0 (0%)	5 (11.6%)
	Total		10 (23.3%)	19 (44.2%)	4 (9.3%)	10 (23.3%)	43 (100%)
Female	Head of household?	Yes	3 (10.7%)	3 (10.7%)	1 (3.6%)	3 (10.7%)	10 (35.7%)
		No	4 (14.3%)	3 (10.7%)	7 (25.0%)	4 (14.3%)	18 (64.3%)
	Total		7 (25.0%)	6 (21.4%)	8 (28.6%)	7 (25.0%)	28 (100%)

**Appendix 25: Date of establishment of farmers' groups in Kirinyaga district**  
N=87

Year established	Frequency	Valid Percent	Age of groups
1967	1	1.15	41
1978	1	1.15	30
1983	1	1.15	25
1987	1	1.15	21
1988	1	1.15	20
1989	1	1.15	19
1993	2	2.3	15
1995	1	1.15	13
1996	2	2.3	12
1997	3	3.45	11
1998	2	2.3	10
1999	2	2.3	9
2000	3	3.45	8
2001	4	4.6	7
2002	6	6.9	6
2003	1	1.15	5
2004	8	9.2	4
2005	9	10.34	3
2006	20	22.99	2
2007	11	12.64	1
2008	7	8.05	<1
Total	87	100	

**Appendix 26: Gender of group leaders in four divisions in Kirinyaga district**  
N=61 groups

	Division				Total
	Central	Gichugu	Mwea	Ndia	Kirinyaga
Chairperson male	6 (4.3%)	12 (8.7%)	18 (13.0%)	5 (3.6%)	41 (29.7%)
Chairperson female	2 (1.4%)	2 (1.4%)	1 (0.7%)	1 (0.7%)	6 (4.3%)
Secretary male	7 (5.1%)	13 (9.4%)	15 (10.9%)	4 (2.9%)	39 (28.3%)
Secretary female	2 (1.4%)	3 (2.2%)	3 (2.2%)	1 (0.7%)	9 (6.5%)
Treasurer male	5 (3.6%)	7 (5.1%)	7 (5.1%)	0 (0%)	19 (13.8%)
Treasurer female	3 (2.2%)	8 (5.8%)	9 (6.5%)	4 (2.9%)	24 (17.4%)
Total	25 (18.1%)	45 (32.6%)	53 (38.4%)	15 (10.9%)	138 (100%)



**Appendix 27: Categories of the main enterprises of small-scale farmers' groups in Kirinyaga district**  
N=88 groups

Enterprise		Responses N	% of responses	% of cases
Ruminant	Dairy (goats)	14	6.5	15.9
	Dairy cattle	13	6.1	14.8
	Bulls	2	0.9	2.3
	Goat farming	2	0.9	2.3
	Cattle	1	0.5	1.1
Non ruminant	Pigs	4	1.9	4.6
	Donkeys	1	0.5	1.1
	Rabbit farming	1	0.5	1.1
Poultry	Poultry	7	3.3	7.9
Bees	Honey / bee keeping	7	3.3	7.9
<b>ICC classification</b>				
Vegetables and melons	Tomatoes	7	3.3	7.9
	Horticulture	4	1.87	4.55
	Kale	3	1.40	3.41
	Cabbages	2	0.93	2.27
	Mushrooms	2	0.93	2.27
	Baby corn	1	0.47	1.14
	Butternuts	1	0.47	1.14
	Carrots	1	0.47	1.14
	Spinach	1	0.47	1.14
Fruit and nuts	Bananas	22	10.28	25.00
	Passion fruit	5	2.34	5.68
	Avocados	4	1.87	4.55
	Mangoes	1	0.47	1.14
Oilseed crops	Soya beans	2	0.93	2.27
	Sunflower	1	0.47	1.14
Root and tuber crops	Sweet potatoes	3	1.40	3.41
	Potatoes	2	0.93	2.27
Beverage crops	Coffee	16	7.48	18.18
	Tea	6	2.80	6.82
Leguminous crops	French beans	15	7.01	17.05
	Beans	9	4.21	10.23
	Cow peas	2	0.93	2.27
	Pigeon peas	1	0.47	1.14
Fibre crops	Cotton	4	1.87	4.55
Cereals	Maize	21	9.81	23.86
	Rice	5	2.34	5.68

Medicinal crops				
	Stinging nettle	1	0.47	1.14
Grasses and other fodder				
	Fodder	1	0.47	1.14
Multipurpose trees				
	Mulberry trees	1	0.47	1.14
Flower crops				
	Cut flowers	2	0.93	2.27
Tree nursery				
	Tree / fruit nursery seedlings	16	7.48	18.18
Total		214	100.00	243.17

**Appendix 28: The main agricultural enterprises produced by farmers' groups**  
N=88

	Division				District Kirinyaga
	Central	Gichugu	Mwea	Ndia	
Bananas	6 (2.8%)	5 (2.3%)	6 (2.8%)	2 (0.9%)	19 (8.9%)
Maize	4 (1.9%)	7 (3.3%)	6 (2.8%)	2 (0.9%)	19 (8.9%)
Coffee	4 (1.9%)	10 (4.7%)	0 (0%)	2 (0.9%)	16 (7.5%)
French beans	3 (1.4%)	5 (2.3%)	6 (2.8%)	1 (0.5%)	15 (7.0%)
Tree / fruit nursery seedlings	2 (0.9%)	7 (3.3%)	2 (0.9%)	4 (1.9%)	15 (7.0%)
Dairy (goats)	6 (2.8%)	1 (0.5%)	4 (1.9%)	3 (1.4%)	14 (6.5%)
Dairy cattle	5 (2.3%)	3 (1.4%)	3 (1.4%)	2 (0.9%)	13 (6.1%)
Beans	1 (.5%)	2 (0.9%)	5 (2.3%)	1 (.5%)	9 (4.2%)
Tomatoes	1 (0.5%)	0 (0%)	6 (2.8%)	0 (0%)	7 (3.3%)
Honey / bee keeping	1 (.5%)	4 (1.9%)	1 (.5%)	1 (.5%)	7 (3.3%)
Poultry	0 (0%)	2 (0.9%)	3 (1.4%)	2 (0.9%)	7 (3.3%)
Tea husbandry	3 (1.4%)	3 (1.4%)	0 (0%)	0 (0%)	6 (2.8%)
Rice	1 (0.5%)	0 (0%)	2 (0.9%)	2 (0.9%)	5 (2.3%)
Passion fruit	0 (0%)	5 (2.3%)	0 (0%)	0 (0%)	5 (2.3%)
Horticulture	2 (0.9%)	1 (0.5%)	0 (0%)	1 (0.5%)	4 (1.9%)
Cotton husbandry	0 (0%)	0 (0%)	4 (1.9%)	0 (0%)	4 (1.9%)
Avocado soap making	0 (0%)	0 (0%)	0 (0%)	4 (1.9%)	4 (1.9%)
Pigs	0 (0%)	3 (1.4%)	1 (0.5%)	0 (0%)	4 (1.9%)
Kale	2 (0.9%)	1 (.5%)	0 (0%)	0 (0%)	3 (1.4%)
Tissue culture banana	1 (0.5%)	1 (0.5%)	0 (0%)	1 (0.5%)	3 (1.4%)
Sweet potatoes	0 (0%)	2 (0.9%)	1 (.5%)	0 (0%)	3 (1.4%)
Cabbages	1 (.5%)	1 (.5%)	0 (0%)	0 (0%)	2 (0.9%)
Potatoes	0 (0%)	2 (0.9%)	0 (0%)	0 (0%)	2 (0.9%)
Soya beans	0 (0%)	0 (0%)	2 (0.9%)	0 (0%)	2 (0.9%)
Mushrooms	1 (.5%)	0 (0%)	0 (0%)	1 (.5%)	2 (0.9%)
Corn oil jelly making (for milking)	0 (0%)	0 (0%)	1 (0.5%)	1 (0.5%)	2 (1.0%)
Cut / flowers production / floriculture	2 (0.9%)	0 (0%)	0 (0%)	0 (0%)	2 (0.9%)
Goat farming	1 (0.5%)	0 (0%)	1 (0.5%)	0 (0%)	2 (0.9%)
Cow peas	1 (0.5%)	0 (0%)	1 (0.5%)	0 (0%)	2 (0.9%)
Bulls	0 (0%)	1 (0.5%)	1 (0.5%)	0 (0%)	2 (0.9%)
Baby corn	0 (0%)	0 (0%)	0 (0%)	1 (0.5%)	1 (0.5%)

Stinging nettle	0 (0%)	1 (0.5%)	0 (0%)	0 (0%)	1 (0.5%)
Cattle	0 (0%)	0 (0%)	1 (0.5%)	0 (0%)	1 (0.5%)
Mangoes	0 (0%)	0 (0%)	1 (.5%)	0 (0%)	1 (.5%)
Butternuts	0 (0%)	0 (0%)	1 (0. 5%)	0 (0%)	1 (0. 5%)
Sunflower	0 (0%)	0 (0%)	1 (0. 5%)	0 (0%)	1 (0. 5%)
Pigeon peas	0 (0%)	0 (0%)	1 (0. 5%)	0 (0%)	1 (0. 5%)
Donkeys	0 (0%)	0 (0%)	1 (0. 5%)	0 (0%)	1 (0. 5%)
Fruit tree nursery	0 (0%)	1 (0.5%)	0 (0%)	0 (0%)	1 (0.5%)
Fodder	0 (0%)	1 (0.5%)	0 (0%)	0 (0%)	1 (0.5%)
Rabbit farming	0 (0%)	1 (0.5%)	0 (0%)	0 (0%)	1 (0.5%)
Carrots	0 (0%)	1 (0.5%)	0 (0%)	0 (0%)	1 (0.5%)
Mulberry trees	1 (0.5%)	0 (0%)	0 (0%)	0 (0%)	1 (0.5%)
Spinach	1 (0.5%)	0 (0%)	0 (0%)	0 (0%)	1 (0.5%)
<b>Total</b>	<b>50 (23.4%)</b>	<b>71 (33.2%)</b>	<b>62 (29.0%)</b>	<b>31 (14.5%)</b>	<b>214 (100%)</b>

## Appendix 29: Main enterprises of small-scale farmers belonging to a group

N=101 farmers belonging to a group

<b>Category</b>	<b>Enterprise</b>	<b>Responses N</b>	<b>% of responses</b>	<b>% of cases</b>
Ruminant	Dairy(cow)	55	11.3	54.46
	Dairy (goats)	18	3.7	17.82
	Bulls	2	0.4	1.98
	Local cattle	2	0.4	1.98
	Local goats	1	0.2	0.99
	Sheep	1	0.2	0.99
Non ruminant	Rabbits	4	0.8	3.96
	Pigs	3	0.6	2.97
Poultry	Poultry	15	3.1	14.85
Fish	Fish farming	2	0.4	1.98
Bees	Bee keeping	4	0.8	3.96
Vegetables and melons	Horticulture	31	6.4	30.69
	Tomatoes	25	5.1	24.75
	Kale	8	1.7	7.92
	Cabbages	8	1.7	7.92
	Watermelons	5	1.0	4.95
	Spinach	1	0.2	0.99
	Butternuts	1	0.2	0.99
	Mushroom	1	0.2	0.99
	Onions	1	0.2	0.99
	Carrots	1	0.2	0.99
Fruit and nuts	Bananas	65	13.4	64.36
	Mangoes	5	1.0	4.95
	Passion fruit	2	0.4	1.98
	Avocados	2	0.4	1.98

Pawpaws	2	0.4	1.98
Root and tuber crops			
Sweet potatoes	3	0.6	2.97
Yams	1	0.2	0.99
Cassava	1	0.2	0.99
Potatoes	1	0.2	0.99
Arrow roots	1	0.2	0.99
Beverage crops			
Coffee	48	10	47.52
Tea	20	4.1	19.80
Leguminous crops			
Beans	37	7.6	36.63
French beans	18	3.7	17.82
Cowpeas	2	0.4	1.98
Pigeon peas	1	0.2	0.99
Cereals			
Maize	77	15.8	76.24
Rice	2	0.4	1.98
Sugar crops			
Sugarcane	1	0.2	0.99
Oilseed crops			
Sunflower	1	0.2	0.99
Flower crops			
Cut flowers	2	0.4	1.98
Fibre crops			
Cotton	3	0.6	2.97
Tree nursery			
Tree/tree nursery	2	0.4	1.98
Total	486	100.00	481.19

**Appendix 30: Other enterprises produced individually by farmers belonging to a group**  
N=101 farmers belonging to a group

Enterprise	Division				District Kirinyaga
	Central	Gichugu	Mwea	Ndia	
Maize	9 (2.5%)	12 (3.3%)	19 (5.3%)	7 (1.9%)	47 (13.1%)
Beans	5 (1.4%)	6 (1.7%)	18 (5.0%)	7 (1.9%)	36 (10.0%)
Banana	9 (2.5%)	6 (1.7%)	12 (3.3%)	8 (2.2%)	35 (9.7%)
Coffee	8 (2.2%)	14 (3.9%)	1 (.3%)	6 (1.7%)	29 (8.1%)
Dairy (cow)	5 (1.4%)	10 (2.8%)	4 (1.1%)	5 (1.4%)	24 (6.7%)
Horticulture	7 (1.9%)	6 (1.7%)	4 (1.1%)	2 (0.6%)	19 (5.3%)
French beans	3 (0.8%)	6 (1.7%)	5 (1.4%)	3 (0.8%)	17 (4.7%)
Tea	7 (1.9%)	8 (2.2%)	0 (0%)	1 (0.3%)	16 (4.5%)
Tomatoes	5 (1.4%)	5 (1.4%)	3 (.8%)	0 (0%)	13 (3.6%)
Poultry	3 (0.8%)	4 (1.1%)	2 (0.6%)	2 (0.6%)	11 (3.1%)
Sweet potatoes	2 (0.6%)	3 (0.8%)	1 (0.3%)	5 (1.4%)	11 (3.1%)
Kale	4 (1.1%)	2 (0.6%)	3 (0.8%)	0 (0%)	9 (2.5%)
Yams	4 (1.1%)	2 (0.6%)	0 (0%)	2 (0.6%)	8 (2.2%)
Rice	0 (0%)	1 (0.3%)	5 (1.4%)	2 (0.6%)	8 (2.2%)

Cabbages	0 (0%)	6 (1.7%)	0 (0%)	1 (0.3%)	7 (1.9%)
Dairy (goats)	0 (0%)	0 (0%)	3 (0.8%)	2 (0.6%)	5 (1.4%)
Goat	0 (0%)	1 (0.3%)	3 (0.8%)	0 (0%)	4 (1.1%)
Rabbit husbandry	1 (0.3%)	1 (0.3%)	1 (0.3%)	1 (0.3%)	4 (1.1%)
Vegetables	2 (0.6%)	1 (0.3%)	0 (0%)	0 (0%)	3 (0.8%)
Cowpeas	1 (0.3%)	0 (0%)	2 (0.6%)	0 (0%)	3 (.8%)
Pawpaws	1 (0.3%)	0 (0%)	2 (0.6%)	0 (0%)	3 (0.8%)
Pigeon peas	1 (0.3%)	0 (0%)	2 (0.6%)	0 (0%)	3 (0.8%)
Butternuts	0 (0%)	1 (0.3%)	2 (0.6%)	0 (0%)	3 (0.8%)
Watermelons	0 (0%)	0 (0%)	3 (0.8%)	0 (0%)	3 (0.8%)
Mushroom production	2 (0.6%)	0 (0%)	0 (0%)	0 (0%)	2 (0.6%)
Passion fruit	0 (0%)	1 (0.3%)	0 (0%)	1 (0.3%)	2 (0.6%)
Capsicum	1 (0.3%)	0 (0%)	1 (0.3%)	0 (0%)	2 (0.6%)
Onions	0 (0%)	0 (0%)	1 (0.3%)	1 (0.3%)	2 (0.6%)
Brinjals	1 (0.3%)	0 (0%)	1 (0.3%)	0 (0%)	2 (0.6%)
Cassava	1 (0.3%)	0 (0%)	1 (0.3%)	0 (0%)	2 (0.6%)
Traditional / local cows	0 (0%)	0 (0%)	2 (0.6%)	0 (0%)	2 (0.6%)
Sugarcane	0 (0%)	2 (0.6%)	0 (0%)	0 (0%)	2 (0.6%)
Mangoes	1 (0.3%)	0 (0%)	0 (0%)	1 (0.3%)	2 (0.6%)
Pumpkins	1 (0.3%)	1 (0.3%)	0 (0%)	0 (0%)	2 (0.6%)
Green gram production	0 (0%)	0 (0%)	2 (0.6%)	0 (0%)	2 (0.6%)
Donkeys	0 (0%)	1 (0.3%)	1 (0.3%)	0 (0%)	2 (0.6%)
Chilies	0 (0%)	0 (0%)	1 (0.3%)	0 (0%)	1 (0.3%)
Baby corn	0 (0%)	0 (0%)	0 (0%)	1 (0.3%)	1 (0.3%)
Bee keeping	0 (0%)	0 (0%)	0 (0%)	1 (0.3%)	1 (0.3%)
Macadamia	0 (0%)	0 (0%)	0 (0%)	1 (0.3%)	1 (0.3%)
Pigs	1 (0.3%)	0 (0%)	0 (0%)	0 (0%)	1 (0.3%)
Fish farming	1 (0.3%)	0 (0%)	0 (0%)	0 (0%)	1 (0.3%)
Arrow roots	0 (0%)	0 (0%)	0 (0%)	1 (0.3%)	1 (0.3%)
Avocado production	1 (0.3%)	0 (0%)	0 (0%)	0 (0%)	1 (0.3%)
Tissue culture banana	1 (0.3%)	0 (0%)	0 (0%)	0 (0%)	1 (0.3%)
Citrus	0 (0%)	0 (0%)	1 (0.3%)	0 (0%)	1 (0.3%)
Dairy farming (cows)	1 (0.3%)	0 (0%)	0 (0%)	0 (0%)	1 (0.3%)
Livestock farming	0 (0%)	0 (0%)	1 (0.3%)	0 (0%)	1 (0.3%)
Dolichos	0 (0%)	0 (0%)	1 (0.3%)	0 (0%)	1 (0.3%)
Agroforestry / multipurpose trees	1 (0.3%)	0 (0%)	0 (0%)	0 (0%)	1 (0.3%)
Total	90 (25.1%)	100 (27.9%)	108 (30.1%)	61 (17.0%)	359 (100%)

# Appendix 31: Main agricultural enterprises produced by farmers not belonging to a group

N=71

Enterprise	Division (count / % of total)				District Kirinyaga
	Central	Gichugu	Mwea	Ndia	
Maize	12 (4.1%)	13 (4.4%)	12 (4.1%)	16 (5.5%)	53 (18.1%)
Coffee	4 (1.4%)	21 (7.2%)	1 (0.3%)	10 (3.4%)	36 (12.3%)
Dairy (cow)	8 (2.7%)	12 (4.1%)	4 (1.4%)	10 (3.4%)	34 (11.6%)
Bananas	8 (2.7%)	9 (3.1%)	3 (1.0%)	10 (3.4%)	30 (10.2%)
Beans	2 (0.7%)	8 (2.7%)	8 (2.7%)	9 (3.1%)	27 (9.2%)
Horticulture	8 (2.7%)	9 (3.1%)	5 (1.7%)	4 (1.4%)	26 (8.9%)
Tea	7 (2.4%)	13 (4.4%)	0 (0%)	0 (0%)	20 (6.8%)
French beans	1 (0.3%)	5 (1.7%)	2 (0.7%)	3 (1.0%)	11 (3.8%)
Tomatoes	5 (1.7%)	2 (0.7%)	2 (0.7%)	1 (0.3%)	10 (3.4%)
Poultry	1 (0.3%)	2 (0.7%)	3 (1.0%)	0 (0%)	6 (2.0%)
Rice	0 (0%)	0 (0%)	4 (1.4%)	1 (0.3%)	5 (1.7%)
Dairy (goats)	2 (0.7%)	0 (0%)	1 (0.3%)	1 (0.3%)	4 (1.4%)
Vegetables	1 (0.3%)	2 (0.7%)	0 (0%)	1 (0.3%)	4 (1.4%)
Sweet Potatoes	0 (0%)	1 (0.3%)	1 (0.3%)	1 (0.3%)	3 (1.0%)
Mangoes	1 (0.3%)	0 (0%)	1 (0.3%)	1 (0.3%)	3 (1.0%)
Butternuts	1 (0.3%)	0 (0%)	2 (0.7%)	0 (0%)	3 (1.0%)
Pawpaws	1 (0.3%)	0 (0%)	1 (0.3%)	0 (0%)	2 (0.7%)
Kale	1 (0.3%)	0 (0%)	0 (0%)	1 (0.3%)	2 (0.7%)
Passion fruit	0 (0%)	1 (0.3%)	0 (0%)	1 (0.3%)	2 (0.7%)
Cabbages	1 (0.3%)	1 (0.3%)	1 (0.3%)	1 (0.3%)	1 (0.3%)
Piggery	0 (0%)	0 (0%)	0 (0%)	1 (0.3%)	1 (0.3%)
Avocados	0 (0%)	0 (0%)	0 (0%)	1 (0.3%)	1 (0.3%)
Floriculture	0 (0%)	0 (0%)	0 (0%)	1 (0.3%)	1 (0.3%)
Yams	0 (0%)	1 (0.3%)	0 (0%)	0 (0%)	1 (0.3%)
Spinach	1 (0.3%)	0 (0%)	0 (0%)	0 (0%)	1 (0.3%)
Cowpeas	0 (0%)	0 (0%)	1 (0.3%)	0 (0%)	1 (0.3%)
Cassava	0 (0%)	0 (0%)	0 (0%)	1 (0.3%)	1 (0.3%)
Potatoes	1 (0.3%)	0 (0%)	0 (0%)	0 (0%)	1 (0.3%)
Pepper /chilies	1 (0.3%)	0 (0%)	0 (0%)	0 (0%)	1 (0.3%)
Cucurbits	0 (0%)	0 (0%)	1 (0.3%)	0 (0%)	1 (0.3%)
Baby corn	0 (0%)	0 (0%)	0 (0%)	1 (0.3%)	1 (0.3%)
Total	67 (22.9%)	99 (33.8%)	52 (17.7%)	75 (25.6%)	293 (100%)

# Appendix 32: Criteria used for ranking agricultural enterprises by farmers' groups

N=89

Criteria	Division				District Kirinyaga
	Central	Gichugu	Mwea	Ndia	
Amount of income generated / profit margins / returns on investment	21 (8.2%)	23 (8.9%)	11 (4.3%)	10 (3.9%)	65 (25.3%)
Availability of market / market information / prices	14 (5.4%)	20 (7.8%)	16 (6.2%)	13 (5.1%)	63 (24.5%)
Food provision / food security	12 (4.7%)	14 (5.4%)	16 (6.2%)	9 (3.5%)	51 (19.8%)
Speed of maturity	6 (2.3%)	5 (1.9%)	11 (4.3%)	3 (1.2%)	25 (9.7%)
Cost of inputs required / capital outlay / production costs	2 (0.8%)	0 (0%)	5 (1.9%)	2 (0.8%)	9 (3.5%)
Ease of management	3 (1.2%)	0 (0%)	1 (0.4%)	1 (0.4%)	5 (1.9%)
Ease of management	3 (1.2%)	0 (0%)	1 (0.4%)	1 (0.4%)	5 (1.9%)
Provision of manure	1 (0.4%)	3 (1.2%)	0 (0%)	0 (0%)	4 (1.6%)
Health and nutritive value	2 (0.8%)	0 (0%)	0 (0%)	2 (0.8%)	4 (1.6%)
Available land sizes	1 (0.4%)	2 (0.8%)	1 (0.4%)	0 (0%)	4 (1.6%)
Labour requirements	2 (0.8%)	1 (0.4%)	1 (0.4%)	0 (0%)	4 (1.6%)
Agroprocessing / value addition opportunities	0 (0%)	0 (0%)	0 (0%)	3 (1.2%)	3 (1.2%)
Environment conservation	0 (0%)	2 (0.8%)	0 (0%)	0 (0%)	2 (0.8%)
Availability of raw materials	0 (0%)	0 (0%)	0 (0%)	2 (0.8%)	2 (0.8%)
Yields / performance of enterprise	0 (0%)	1 (0.4%)	1 (0.4%)	0 (0%)	2 (0.8%)
Availability of animal feeds / fodder	0 (0%)	0 (0%)	2 (0.8%)	0 (0%)	2 (0.8%)
Crop rotation / mixed cropping	0 (0%)	0 (0%)	2 (0.8%)	0 (0%)	2 (0.8%)
Resistance to drought	0 (0%)	0 (0%)	2 (0.8%)	0 (0%)	2 (0.8%)
Risk management	0 (0%)	1 (0.4%)	0 (0%)	0 (0%)	1 (0.4%)
Biodiversity contribution	0 (0%)	1 (0.4%)	0 (0%)	0 (0%)	1 (0.4%)
Employment creation opportunities	0 (0%)	0 (0%)	0 (0%)	1 (0.4%)	1 (0.4%)
Climatic / agroecological conditions	0 (0%)	0 (0%)	1 (0.4%)	0 (0%)	1 (0.4%)
Amount of rainfall	0 (0%)	0 (0%)	1 (0.4%)	0 (0%)	1 (0.4%)
Availability of irrigation water	0 (0%)	0 (0%)	1 (0.4%)	0 (0%)	1 (0.4%)
Access to loans / school fees	0 (0%)	0 (0%)	0 (0%)	1 (0.4%)	1 (0.4%)
Availability of information / technology	1 (0.4%)	0 (0%)	0 (0%)	0 (0%)	1 (0.4%)
Total	65 (25.3%)	73 (28.4%)	72 (28.0%)	47 (18.3%)	257 (100%)

### Appendix 33: Criteria used for ranking enterprises by farmers belonging to a group

N=97

	Division				Total
	Central	Gichugu	Mwea	Ndia	Kirinyaga
Amount of income generated / profit	26 (10.2%)	34 (13.4%)	22 (8.7%)	21 (8.3%)	103 (40.6%)
Food provision / food security	22 (8.7%)	18 (7.1%)	17 (6.7%)	15 (5.9%)	72 (28.3%)
Speed of maturity	3 (1.2%)	7 (2.8%)	5 (2.0%)	5 (2.0%)	20 (7.9%)
Availability of market / good prices	2 (0.8%)	1 (0.4%)	6 (2.4%)	5 (2.0%)	14 (5.5%)
Climatic / agroecological conditions	1 (0.4%)	1 (0.4%)	5 (2.0%)	2 (0.8%)	9 (3.5%)
Provision of manure	2 (0.8%)	4 (1.6%)	0 (0%)	1 (0.4%)	7 (2.8%)
Cost of inputs required / capital outlay / production costs	0 (0%)	1 (0.4%)	2 (0.8%)	2 (0.8%)	5 (2.0%)
Access to loans	1 (0.4%)	1 (0.4%)	1 (0.4%)	1 (0.4%)	4 (1.6%)
Ease of management	0 (0%)	1 (0.4%)	3 (1.2%)	0 (0%)	4 (1.6%)
Environment conservation / soil fertility	0 (0%)	1 (0.4%)	2 (0.8%)	1 (0.4%)	4 (1.6%)
Availability of information / technology	0 (0%)	1 (0.4%)	2 (0.8%)	0 (0%)	3 (1.2%)
Resistance to drought	0 (0%)	0 (0%)	3 (1.2%)	0 (0%)	3 (1.2%)
Availability of animal feeds / fodder	0 (0%)	1 (0.4%)	0 (0%)	1 (0.4%)	2 (0.8%)
Crop rotation / mixed cropping	0 (0%)	0 (0%)	2 (0.8%)	0 (0%)	2 (0.8%)
Availability of irrigation water	0 (0%)	0 (0%)	2 (0.8%)	0 (0%)	2 (0.8%)
Total	57 (22.4%)	71 (28.0%)	72 (28.3%)	54 (21.3%)	254 (100.0%)

### Appendix 34: Criteria considered for ranking enterprises by farmers not belonging to a group

N=69

Criteria for ranking enterprises	Division				District
	Central	Gichugu	Mwea	Ndia	Kirinyaga
Food provision / food security	11 (8.7%)	5 (4.0%)	11 (8.7%)	6 (4.8%)	33 (26.2%)
Availability of market / market information / prices	4 (3.2%)	3 (2.4%)	2 (1.6%)	9 (7.1%)	18 (14.3%)
Speed of maturity	1 (0.8%)	3 (2.4%)	1 (0.8%)	2 (1.6%)	7 (5.6%)
Crop rotation / mixed cropping	0 (0%)	5 (4.0%)	0 (0%)	0 (0%)	5 (4.0%)
Crop rotation / mixed cropping	0 (0%)	5 (4.0%)	0 (0%)	0 (0%)	5 (4.0%)
Crop rotation / mixed cropping	0 (0%)	5 (4.0%)	0 (0%)	0 (0%)	5 (4.0%)
Availability of animal feeds / fodder	0 (0%)	2 (1.6%)	0 (0%)	1 (0.8%)	3 (2.4%)
Agroprocessing / value addition opportunities	0 (0%)	2 (1.6%)	0 (0%)	0 (0%)	2 (1.6%)
Provision of manure	1 (0.8%)	0 (0%)	0 (0%)	1 (0.8%)	2 (1.6%)
Ease of management	0 (0%)	0 (0%)	1 (0.8%)	1 (0.8%)	2 (1.6%)
Labour requirements	0 (0%)	1 (0.8%)	0 (0%)	1 (0.8%)	2 (1.6%)
Resistance to pests / diseases	1 (0.8%)	0 (0%)	0 (0%)	1 (0.8%)	2 (1.6%)
Health and nutritive value	0 (0%)	0 (0%)	1 (0.8%)	0 (0%)	1 (0.8%)



Risk management	0 (0%)	0 (0%)	0 (0%)	1 (0.8%)	1 (0.8%)
Environment conservation	0 (0%)	0 (0%)	0 (0%)	1 (0.8%)	1 (0.8%)
Biodiversity contribution	1 (0.8%)	0 (0%)	0 (0%)	0 (0%)	1 (0.8%)
Employment creation opportunities	0 (0%)	1 (0.8%)	0 (0%)	0 (0%)	1 (0.8%)
Availability of raw materials	0 (0%)	0 (0%)	0 (0%)	1 (0.8%)	1 (0.8%)
Yields / performance of enterprise	0 (0%)	0 (0%)	0 (0%)	1 (0.8%)	1 (0.8%)
Amount of rainfall	1 (0.8%)	0 (0%)	0 (0%)	0 (0%)	1 (0.8%)
<b>Total</b>	<b>30 (23.8%)</b>	<b>42 (33.3%)</b>	<b>23 (18.3%)</b>	<b>31 (24.6%)</b>	<b>126 (100%)</b>

**Appendix 35: Main agricultural enterprises ranked as priority number one to three by farmers' groups**  
N=87

	Division				Total
	Central	Gichugu	Mwea	Ndia	Kirinyaga
Maize	6 (2.7%)	7 (3.2%)	14 (6.3%)	2 (0.9%)	29 (13.1%)
Coffee	3 (1.4%)	15 (6.8%)	0 (0%)	4 (1.8%)	22 (10.0%)
Banana	7 (3.2%)	3 (1.4%)	4 (1.8%)	6 (2.7%)	20 (9.0%)
French beans	2 (0.9%)	5 (2.3%)	8 (3.6%)	2 (0.9%)	17 (7.7%)
Beans	4 (1.8%)	1 (0.5%)	9 (4.1%)	1 (0.5%)	15 (6.8%)
Dairy (cow)	5 (2.3%)	5 (2.3%)	0 (0%)	2 (0.9%)	12 (5.4%)
Tea husbandry	3 (1.4%)	7 (3.2%)	0 (0%)	0 (0%)	10 (4.5%)
Tomatoes	0 (0%)	0 (0%)	6 (2.7%)	1 (0.5%)	7 (3.2%)
Horticulture	2 (0.9%)	0 (0%)	2 (0.9%)	2 (0.9%)	6 (2.7%)
Tree / fruit seedlings	1 (0.5%)	3 (1.4%)	1 (0.5%)	1 (0.5%)	6 (2.7%)
Kale	3 (1.4%)	1 (0.5%)	1 (0.5%)	0 (0%)	5 (2.3%)
Honey / bee keeping	1 (0.5%)	2 (0.9%)	1 (0.5%)	1 (0.5%)	5 (2.3%)
Poultry production	1 (0.5%)	1 (0.5%)	1 (0.5%)	1 (0.5%)	4 (1.8%)
Cotton	0 (0%)	0 (0%)	4 (1.8%)	0 (0%)	4 (1.8%)
Rice	0 (0%)	0 (0%)	3 (1.4%)	1 (0.5%)	4 (1.8%)
Yams	0 (0%)	4 (1.8%)	0 (0%)	0 (0%)	4 (1.8%)
Sweet potatoes	0 (0%)	1 (0.5%)	2 (0.9%)	1 (0.5%)	4 (1.8%)
Baby corn	1 (0.5%)	0 (0%)	0 (0%)	2 (0.9%)	3 (1.4%)
Pigs	0 (0%)	3 (1.4%)	0 (0%)	0 (0%)	3 (1.4%)
Cowpeas	0 (0%)	0 (0%)	3 (1.4%)	0 (0%)	3 (1.4%)
Cut flowers floriculture	2 (0.9%)	0 (0%)	1 (0.5%)	0 (0%)	3 (1.4%)
Rabbit farming	2 (0.9%)	0 (0%)	0 (0%)	0 (0%)	2 (0.9%)
Soya beans	0 (0%)	0 (0%)	2 (0.9%)	0 (0%)	2 (0.9%)
Mangoes	0 (0%)	0 (0%)	0 (0%)	2 (0.9%)	2 (0.9%)
Avocados	0 (0%)	0 (0%)	0 (0%)	2 (0.9%)	2 (0.9%)
Tissue culture banana	1 (0.5%)	0 (0%)	0 (0%)	1 (0.5%)	2 (0.9%)
Fish farming	1 (0.5%)	1 (0.5%)	0 (0%)	0 (0%)	2 (0.9%)
Brinjals	0 (0%)	0 (0%)	1 (0.5%)	0 (0%)	1 (0.5%)
Pigeon peas	0 (0%)	0 (0%)	1 (0.5%)	0 (0%)	1 (0.5%)
Food crops	0 (0%)	0 (0%)	1 (0.5%)	0 (0%)	1 (0.5%)
Radish	0 (0%)	0 (0%)	0 (0%)	1 (0.5%)	1 (0.5%)

Corn oil jelly <sup>96</sup>	0 (0%)	0 (0%)	0 (0%)	1 (0.5%)	1 (0.5%)
Fodder	0 (0%)	1 (0.5%)	0 (0%)	0 (0%)	1 (0.5%)
Mushroom production	1 (0.5%)	0 (0%)	0 (0%)	0 (0%)	1 (0.5%)
Cabbages production	1 (0.5%)	0 (0%)	0 (0%)	0 (0%)	1 (0.5%)
Green gram production	0 (0%)	0 (0%)	1 (0.5%)	0 (0%)	1 (0.5%)
Mulberry trees	1 (0.5%)	0 (0%)	0 (0%)	0 (0%)	1 (0.5%)
Total	54 (24.4%)	62 (28.1%)	69 (31.2%)	36 (16.3%)	221 (100%)

**Appendix 36: Enterprises ranked priority number one by farmers' groups and type of group**  
N=87

	Type of Group				Kirinyaga district
	Male only	Female only	Youth only	Mixed	
French beans	2 (2.3%)	5 (5.7%)	0 (0%)	5 (5.7%)	12 (13.8%)
Tissue culture banana	0 (0%)	1 (1.1%)	0 (0%)	0 (0%)	11 (1.1%)
Maize	1 (1.1%)	2 (2.3%)	0 (0%)	8 (9.2%)	11 (12.6%)
Coffee	0 (0%)	1 (1.1%)	0 (0%)	8 (9.2%)	9 (10.3%)
Tea husbandry	0 (0%)	1 (1.1%)	2 (2.3%)	4 (4.6%)	7 (8.0%)
Dairy (cow)	1 (1.1%)	2 (2.3%)	0 (0%)	3 (3.4%)	6 (6.9%)
Dairy (goats)	0 (0%)	1 (1.1%)	0 (0%)	5 (5.7%)	6 (6.9%)
Tree / fruit tree seedlings	0 (0%)	2 (2.3%)	1 (1.1%)	2 (2.3%)	5 (5.7%)
Banana	0 (0%)	1 (1.1%)	0 (0%)	3 (3.4%)	4 (4.6%)
Honey / bee keeping	0 (0%)	1 (1.1%)	0 (0%)	2 (2.3%)	3 (3.4%)
Cut / flowers / floriculture	0 (0%)	0 (0%)	0 (0%)	3 (3.4%)	3 (3.4%)
Cotton	0 (0%)	0 (0%)	0 (0%)	3 (3.4%)	3 (3.4%)
Yams	0 (0%)	0 (0%)	0 (0%)	3 (3.4%)	3 (3.4%)
Horticulture	0 (0%)	1 (1.1%)	1 (1.1%)	1 (1.1%)	3 (3.4%)
Sweet potatoes	0 (0%)	1 (1.1%)	0 (0%)	1 (1.1%)	2 (2.3%)
Fish farming	0 (0%)	0 (0%)	0 (0%)	2 (2.3%)	2 (2.3%)
Pigs	1 (1.1%)	0 (0%)	0 (0%)	0 (0%)	1 (1.1%)
Tomatoes	0 (0%)	0 (0%)	0 (0%)	1 (1.1%)	1 (1.1%)
Baby corn	1 (1.1%)	0 (0%)	0 (0%)	0 (0%)	1 (1.1%)
Avocados	0 (0%)	0 (0%)	0 (0%)	1 (1.1%)	1 (1.1%)
Corn oil jelly (for milking)	0 (0%)	0 (0%)	0 (0%)	1 (1.1%)	1 (1.1%)
Cowpeas	0 (0%)	0 (0%)	0 (0%)	1 (1.1%)	1 (1.1%)
Rabbit farming	0 (0%)	0 (0%)	0 (0%)	1 (1.1%)	1 (1.1%)
Total	6 (6.9%)	19 (21.8%)	4 (4.6%)	58 (66.7%)	87 (100%)

<sup>96</sup> Corn oil jelly is used for milking.

**Appendix 37: Enterprises ranked number one by small-scale farmers belonging to a farmers' group and what the enterprise was for**  
N=99

Agricultural enterprise ranked no. 1	What the enterprise ranked priority number 1 was for			
	Cash	Subsistence	Manure	Total
Maize	7 (7.1%)	7 (7.1%)	0 (0%)	14 (14.1%)
Tea	14 (14.1%)	0 (0%)	0 (0%)	14 (14.1%)
Coffee	13 (13.1%)	1 (1.0%)	0 (0%)	14 (14.1%)
Dairy(cow)	9 (9.1%)	1 (1.0%)	1 (1.0%)	11 (11.1%)
Bananas	7 (7.1%)	1 (1.0%)	0 (0%)	8 (8.1%)
French beans	8 (8.1%)	0 (0%)	0 (0%)	8 (8.1%)
Tomatoes	6 (6.1%)	1 (1.0%)	0 (0%)	7 (7.1%)
Horticulture	5 (5.1%)	0 (0%)	0 (0%)	5 (5.1%)
Dairy (goats)	4 (4.0%)	0 (0%)	0 (0%)	4 (4.0%)
Passion fruit	2 (2.0%)	0 (0%)	0 (0%)	2 (2.0%)
Bee keeping	2 (2.0%)	0 (0%)	0 (0%)	2 (2.0%)
Poultry	1 (1.0%)	0 (0%)	0 (0%)	1 (1.0%)
Rice	1 (1.0%)	0 (0%)	0 (0%)	1 (1.0%)
Avocados	1 (1.0%)	0 (0%)	0 (0%)	1 (1.0%)
Mangoes	1 (1.0%)	0 (0%)	0 (0%)	1 (1.0%)
Piggery	1 (1.0%)	0 (0%)	0 (0%)	1 (1.0%)
Floriculture	1 (1.0%)	0 (0%)	0 (0%)	1 (1.0%)
Trees/tree nursery	1 (1.0%)	0 (0%)	0 (0%)	1 (1.0%)
Microfinance	1 (1.0%)	0 (0%)	0 (0%)	1 (1.0%)
Pawpaws	1 (1.0%)	0 (0%)	0 (0%)	1 (1.0%)
Cotton	1 (1.0%)	0 (0%)	0 (0%)	1 (1.0%)
Total	87 (87.9%)	11 (11.1%)	1 (1.0%)	99 (100%)

**Appendix 38: Enterprises ranked priority number two by farmers belonging to a group and what the enterprise was ranked number two for**  
N=98

Enterprise ranked priority number 2		What the enterprise ranked 2 for		Total
		Cash	Subsistence	
Dairy(cow)	Count	19 (19.4%)	3 (3.1%)	22 (22.4%)
Coffee		16 (16.3%)	0 (0%)	16 (16.3%)
Maize		6 (6.1%)	7 (7.1%)	13 (13.3%)
Bananas		8 (8.2%)	2 (2.0%)	10 (10.2%)
Beans		5 (5.1%)	1 (1.0%)	6 (6.1%)
French beans		6 (6.1%)	0 (0%)	6 (6.1%)
Tomatoes		6 (6.1%)	0 (0%)	6 (6.1%)
Horticulture		5 (5.1%)	1 (1.0%)	6 (6.1%)
Watermelons		4 (4.1%)	0 (0%)	4 (4.1%)
Tea		2 (2.0%)	0 (0%)	2 (2.0%)
Dairy (goats)		2 (2.0%)	0 (0%)	2 (2.0%)
Poultry		2 (2.0%)	0 (0%)	2 (2.0%)

Carrots	1 (1.0%)	0 (0%)	1 (1.0%)
Kale	0 (0%)	1 (1.0%)	1 (1.0%)
Cotton	1 (1.0%)	0 (0%)	1 (1.0%)
Total	83 (84.7%)	15 (15.3%)	98 (100%)

**Appendix 39: Enterprises ranked priority number one by farmers not belonging to a group**  
N=71

	<b>Frequency</b>	<b>Valid Percent</b>
Coffee	13	18.3
Tea	12	16.9
Dairy (cow)	10	14.1
Maize	8	11.3
Horticulture	8	11.3
Bananas	5	7.0
Rice	4	5.6
French beans	4	5.6
Tomatoes	3	4.2
Kale	1	1.4
Mangoes	1	1.4
Passion fruit	1	1.4
Pawpaws	1	1.4
Total	71	100.0

**Appendix 40: Enterprises ranked priority number two by farmers not belonging to a group**  
N=71

	<b>Frequency</b>	<b>Valid Percent</b>
Coffee	12	17.4
Maize	12	17.4
Bananas	11	15.9
Tea	7	10.1
Dairy(cow)	7	10.1
Horticulture	5	7.2
Beans	4	5.8
French beans	3	4.3
Tomatoes	2	2.9
Poultry	2	2.9
Kale	1	1.4
Piggery	1	1.4
Sweet potatoes	1	1.4
Butternuts	1	1.4
Total	69	100.0
Missing	N/A	
Total	71	

**Appendix 41: Analysis of information, advice or training needs of farmers' groups for agricultural activities they would like to introduce or improve by type of group**  
N=83

Count / % within group	Type of Group				District Kirinyaga
	Male only	Female only	Youth Only	Mixed	
Crop husbandry	3 (21.4%)	11 (29.7%)	1 (50%)	30 (27.3%)	45
Animal husbandry	2 (14.3)	8 (21.6%)	0 (0%)	24 (21.8%)	34
Value addition	2 (4.3%)	6 (16.2%)	0 (0%)	9 (8.2%)	17
Marketing / price information	2 (14.3%)	3 (8.1%)	0 (0%)	11 (10.0%)	16
Improved technologies / farming systems	1 (7.1%)	1 (2.7%)	0 (0%)	6 (5.5%)	8
Farm management	1 (7.1%)	1 (2.7%)	1 (50%)	4 (3.6%)	7
Soil sampling / fertility	0 (0%)	1 (2.7%)	0 (0%)	4 (3.6%)	5
Tree / fruit tree nursery	0 (0%)	0 (0%)	0 (0%)	4 (3.6%)	4
Seeds and seedling varieties	0 (0%)	1 (2.7%)	0 (0%)	4 (3.6%)	5
Soil sampling / fertility	0 (0%)	1 (2.7%)	0 (0%)	4 (3.6%)	5
Pests and diseases	0 (0%)	2 (5.4%)	0 (0%)	3 (2.7%)	5
Agrochemical use	1 (7.1%)	0 (0%)	0 (0%)	3 (2.7%)	4
Manure	0 (0%)	1 (2.7%)	0 (0%)	2 (1.8%)	3
Safe use of pesticides	0 (0%)	1 (2.7%)	0 (0%)	1 (0.9%)	2
Animal feeds	0 (0%)	0 (0%)	0 (0%)	1 (0.9%)	1
Fertiliser use and application	0 (0%)	0 (0%)	0 (0%)	1 (0.9%)	1
Animal health	0 (0%)	0 (0%)	0 (0%)	1 (0.9%)	1
Sources of credit	0 (0%)	0 (0%)	0 (0%)	1 (0.9%)	1
Medicinal plants	0 (0%)	0 (0%)	0 (0%)	1 (0.9%)	1
HIV/AIDS	1 (7.1%)	0 (0%)	0 (0%)	0 (0%)	1
Irrigation	0 (0%)	1 (2.7%)	0 (0%)	0 (0%)	1
NHIF	1 (7.1%)	0 (0%)	0 (0%)	0 (0%)	1
Total	14	37	2	110	163

**Appendix 42: A gender analysis of information needs of small-scale farmers for the enterprise ranked priority number one**

N=101 for farmers belonging to a group, N=71 for farmers not belonging to a group

Farmers belonging to a group				Farmers not belonging to a group		
	Male	Gender Female	N	Male	Gender Female	N
	Count (% within gender)					
Crop husbandry	32 (56.1%)	25 (43.9%)	57	35 (60.3%)	23 (39.7%)	58
Animal husbandry	24 (63.2%)	14 (36.8%)	38	5 (55.6%)	4 (44.4%)	9
Pests and diseases	20 (76.9%)	6 (23.1%)	26	12 (60%)	8 (40%)	20
Marketing / price information	16 (66.7%)	8 (33.3%)	24	8 (88.9%)	1 (11.1%)	9
Seeds and seedling varieties	13 (61.9%)	8 (38.1%)	21	13 (65%)	7 (35%)	20
Agrochemical use	8 (50%)	8 (50%)	16	2 (66.7%)	1 (33.3%)	3
Fertiliser use and application	10 (66.7%)	5 (33.3%)	15	11 (50%)	11 (50%)	22
Value addition	0 (0%)	3 (100%)	3	1 (100%)	0 (0%)	1
Nutrition	2 (100%)	0 (0%)	2	-	-	-
Soil sampling /	1 (50%)	1 (50%)	2	2 (66.7)	1 (33.3%)	3

fertility						
Farm management	0 (0%)	1 (100%)	1	1 (100%)	0 (0%)	1
Manures	0 (0%)	1 (100%)	1	1 (100%)	0 (0%)	1
Good agricultural practices / farming systems	1 (100%)	0 (0%)	1	3 (50%)	3 (50%)	6
Tree / fruit tree nursery	1 (100%)	0 (0%)	1	-	-	-
Breeding	-	-	-	4 (66.7%)	2 (33.3%)	6
Total	128	80	208	98	61	159

**Appendix 43: A gender analysis of information needs of small-scale farmers for technologies or production methods they would like to introduce but do not have sufficient information about**  
N=81 for farmers belonging to a group, N=52 for farmers not belonging to a group

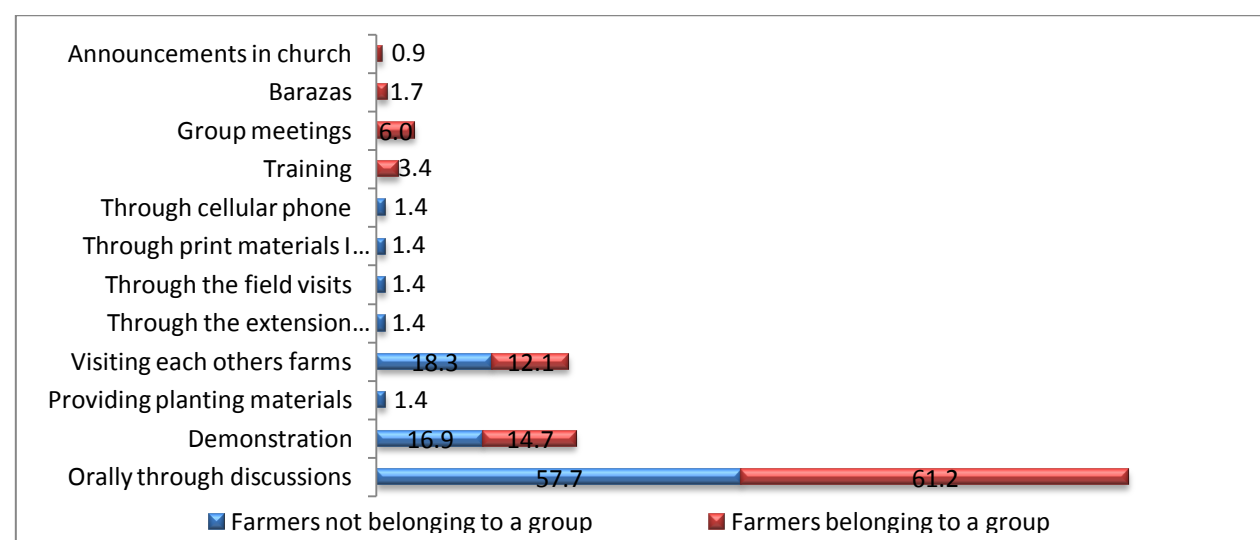
group	Farmers belonging to a group			Farmers not belonging to a group		
	Male	Gender Female	Total	Male	Gender Female	Total
Crop husbandry	36 (38.3%)	13 (26.0%)	49	13 (25.5%)	17 (43.6%)	30
Animal husbandry	23 (24.5%)	17 (34%)	40	7 (13.7%)	6 (15.4%)	13
Value addition	7 (7.4%)	6 (12%)	13	2 (3.9%)	1 (2.6%)	3
Markets / price information	5 (5.3%)	2 (4%)	7	4 (7.8%)	2 (5.1%)	6
Pests and diseases	5 (5.3%)	1 (2%)	6	5 (9.8%)	1 (2.6%)	6
Agrochemical use	6 (6.4%)	0 (0%)	6	4 (7.8%)	1 (2.6%)	5
Fertiliser use / application	2 (2.1 %)	2 (4%)	4	2 (3.9%)	2 (5.1%)	4
Soil sampling / fertility	4 (4.3 %)	0 (0%)	4	2 (3.9%)	1 (2.6%)	3
Seeds and seedling varieties	2 (2.1%)	2 (4%)	4	1 (2%)	6 (15.4%)	7
Animal feeds / fodder	1 (1.1%)	2 (4%)	3			
Energy saving / conservation	0 (0%)	2 (4%)	2	1 (2%)	1 (2.6%)	2
Group management	1 (1.1%)	1 (2%)	2			
New improved technologies / methods	1 (1.1 %)	0 (0%)	1	7 (13.7%)	1 (2.6%)	8
Sources of credit	0 (0%)	1 (2%)	1			
Breeding	1 (1.1%)	0 (0%)	1			
Manure	0 (0%)	1 (2%)	1	1 (2%)	0 (0%)	1
Tree / fruit tree nursery / forest products				1 (2%)	0 (0%)	1
Farm management				1 (100%)	0 (0%)	1
<b>Total</b>	<b>94</b>	<b>50</b>	<b>144</b>	<b>51</b>	<b>39</b>	<b>90</b>

#### Appendix 44: Some examples of efforts made by farmers not belonging to a group to get information, advice or training

I called the extension officer to come and advise me but I was informed that the agricultural personnel use the group approach to reach farmers.  
 I attended the education day at MIAD and I obtained information on rice farming and was satisfied.  
 I did not receive enough information.  
 I was informed about training on mushroom production but I did not have sufficient money to pay for training.  
 I heard about genetically modified organisms at a seminar by an NGO but there was resistance regarding use of GMOs and I had no access to further information.  
 Africa Harvest provided training on TCB husbandry and we adopted the technology.  
 I tried to get the extension officers but they were very busy and not accessible.  
 I saw other farmers producing passion fruit and I started producing but the crop obtained diseased.  
 I obtained information but I did not have enough money to buy the farm inputs required.  
 The information I obtained was theoretical and I could not practice organic farming without practical sessions.

#### Appendix 45: How small-scale farmers shared external information that they accessed

N=91 for farmers belonging to a group, N=58 for farmers not belonging to a group



#### Appendix 46: Some examples on how local knowledge was shared

##### Pest and disease management

I used ash in rice farming, which helped prevent pests that damage the rice and shared the knowledge with other farmers.

My cow obtained East Coast Fever and I used a traditional herb to cure it. I demonstrated what I was doing to my children and neighbour.

I used Aloe vera and chillies to treat Coccidiosis in chickens and shared the information with my neighbour.

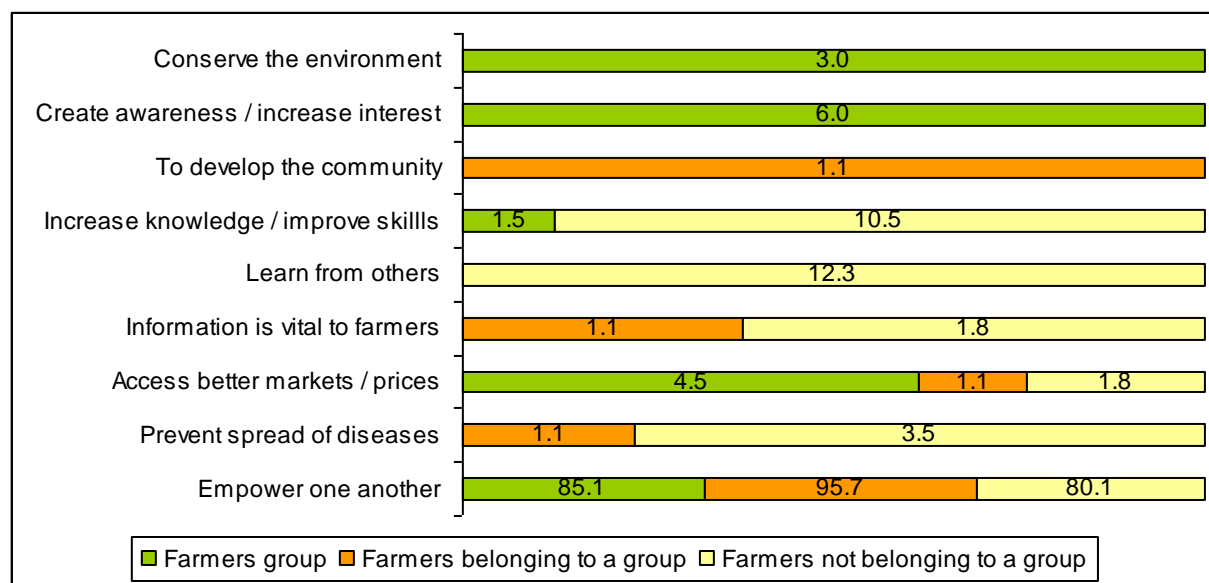
##### Crop and animal husbandry

I shared information on traditional ways of planting yams with the younger people in the community - cutting the planting material, planting material, digging shallow holes and turning the planting material upside down then covering it with a little soil.

I assisted another farmer to plant cassava, bananas and sweet potatoes in the traditional way.

## Appendix 47: Reasons for sharing external agricultural information and knowledge

N=67 for farmers' groups, N=87 for farmers belonging to a group and N=57 for farmers not belonging to a group



## Appendix 48: Reasons farmers' groups shared external information and / or local knowledge

### Learning

To experiment and compare local and external agricultural knowledge.

To pass on valuable knowledge so others can benefit, be enlightened and solve agricultural problems.

To exchange knowledge and ideas.

### Efficacy and cost reduction

It is a stop gap measure e.g. the use of Aloe vera before seeking external help.

To minimise pests and control diseases e.g. with ashes, *Aloe vera* and Mweri (*Prunus Africana*).

Because external agricultural knowledge was not available.

To bring down production costs (indigenous methods are economical and affordable).

To improve the quality and quantity of produce (organic produce).

The materials used are locally available, are effective and have no cost implications.

Local knowledge options are cheaper and a more sustainable.

### Environment conservation

To conserve the environment (biodiversity, control erosion, enhance soil fertility).

Indigenous methods do not use chemicals hence conserve the environment.

### Response to market

To respond to market needs e.g. for traditionally produced honey and organic produce.

To provide fodder for dairy goats e.g. Mugio (*Triumfetta tomentosa*), Mithathi (*Cassipourea malosana*), Mitondo (*Julbernardia globiflora*), Mikoigo (*Bridelia micrantha*), Muringa (*Cordia africana*), Mugumo (*Ficus natalensis*).

### Preservation and sustainability

To preserve the good old ideas that work.

To help the younger generation.



## **Appendix 49: Reasons for combining external information and local knowledge**

### **Reduce costs**

Because external options alone are expensive and combining reduces the cost of production.

To save time and money.

### **Increase production / improve farming**

To improve animal / plant / soil health.

To improve quality, increase yields and income.

### **Learning and discovery**

To experiment and find out what is effective.

To compare the two types of information / knowledge.

### **Efficiency and effectiveness**

Because both types are viable.

Exotic chemicals are sometimes not effective.

It is easier to get local information than external information.

To improve the efficacy of both methods in controlling pests.

Based on my experience, the crop performance was better when ashes were mixed with chemicals.

### **Managing risk**

To complement the different methods, so that if one option failed, the other would work.

### **Environment conservation and sustainability**

Because the local methods such as the use of manure are long lasting and more sustainable than fertilisers.

To protect and conserve the environment by reducing the amount of chemicals used.

To improve soil structure, texture and fertility.

To improve human health.

## **Appendix 50: Examples of farmers' feelings / emotions about mixing external information and local knowledge**

### **Happiness**

Happy about mixing as it yields better results and yields.  
Comfortable about mixing as it is complementary / sustainable.  
I feel motivated to use both external and local knowledge.  
Mixing reduces input costs  
Mixing provides the option of adopting whatever one can afford.

### **Disagreement**

They do not mix well.  
There is a high chance of failure when using local knowledge.

### **Uncertainty**

Knowledge on indigenous methods is scarce and only a few practiced it.  
Not sure because some information obtained does not work.  
I wonder if mixing is beneficial.  
Mixing leads to conflicting results / not compatible.  
We do not have sufficient information on mixing / dose / usage local knowledge.  
Sometimes we get confused about what to use first because of getting different conflicting information.  
We do not know where to get the local materials for use.  
Productivity is sometimes low where local knowledge is used in place of external knowledge  
Local knowledge was of low efficacy.  
There are insufficient knowledgeable people to train us in the community.  
Sometimes we mix to try out ideas and experiment.  
I feel I gain more from external information.

### **Mixed feelings**

External knowledge is expensive but easier to use and yields better results.  
Sometimes external information does not work so I end up using local knowledge.  
Indigenous methods are cultural, locally available but need to be conserved through mixing.

# Appendix 51: Main sources of agricultural information and knowledge by divisions and sub-locations

Location	Koroma	Central Inoi	Mutira	Karumandi	Gichugu Ngariama	Baragwi	Murinduko	Mwea Kangai	Muthithi	Mwerua	Ndia Kiine	Kariti
<b>Source</b>												
<b>Local</b>												
Community elders	√	√	√							√	√	√
Farmer cooperative societies	√	√	√	√	√	√	√	√	√	√	√	√
Farmers' groups	√	√	√	√	√	√	√	√	√			
Friends	√	√	√							√	√	√
Neighbours	√	√	√	√	√	√	√	√	√			
Other farmers	√	√	√									
Relatives	√	√	√							√	√	√
Schools 4K-Clubs		√	√				x	x	x	√	√	√
<b>Public institutions</b>												
Agricultural Finance Corporation	√											
Coffee Research Foundation (CRF)				√								
Forestry Department extension		√		√	√	√	√			√		
Horticultural Crops Development Authority (HCDA)											√	√
Jomo Kenyatta University of Agriculture and Technology (JKUAT)					√						√	√

Kamweti Agricultural Training Centre (KATC)	√	√	√	√	√	√	√	√	√	√	√	√	√
Kenya Agricultural Research Institute (KARI)	√					√							
MIAD									√				
Ministry of Agriculture Extension	√	√	√	√	√	√	√	√	√	√	√	√	√
Ministry of Gender, Children and Social Development	√	√	√	√	√	√	√	√	√	√	√	√	√
Ministry of Health	√	√	√	√	√	√	√	√	√	√	√	√	√
Ministry of Livestock Development	√	√	√	√	√	√	√	√	√	√	√	√	√
Ministry of Water	√	√	√	√	√	√	√	√	√	√	√	√	√
National Cereals and Produce Board (NCPB)									√				
National Irrigation Board (NIB)									√		√	√	
Office of the President – Barazas	√	√	√	√	√	√	√	√	√	√	√	√	√
Tea Research Foundation			√	√									
<b>Private sector</b>													
Agrochemical companies	√	√	√	√	√	√	√	√	√	√	√	√	√
Cooperatives													
Hatcheries													
Honey Care		√											

Horticultural exporters													
Kenya Farmers Planters Union (KPCU)													
Kenya Tea Development Agency	√	√	√	√	√	√							
Private veterinary doctors / clinicians													
Seed manufacturers	√	√	√	√	√	√	√	√	√	√	√	√	√
Stockists	√	√	√	√	√	√	√	√	√	√	√	√	√
<hr/>													
<b>NGOs / Religious organisations</b>													
Africa Harvest Association for Better Land Husbandry (ABLH)												√	
Catholic Diocese	√												
Christian Community Service	√						√						
Dairy Goat Association of Kenya (DGAK)	√	√	√	√	√	√	√	√	√	√	√	√	√
DrumNet				√									
Green Belt Movement					√								
Kenya Institute of Organic Farming (KIOF)			√										
SACDEP											√		
TechnoServe	√												

<b>International / development partners</b>				
International Centre for Insect Physiology and Ecology (ICIPE)	√	√		
International Fund for Agricultural Development (IFAD)			√	√
The International Small Group and Tree Planting Program (TIST)		√		
World Agroforestry Centre (ICRAF)				√

**Appendix 52: Analysis of the main sources of advice, information and knowledge by division**  
N=85

Source	Division			
	Central	Gichugu	Mwea	Ndia
Extension (public sector) (N=62)	12 (32.4%)	21 (45.7%)	17 (34%)	12 (35.3%)
Private sector (N=30)	2 (5.4%)	6 (13.0%)	18 (36%)	4 (11.8%)
Neighbour (N=23)	8 (21.6%)	5 (10.9%)	6 (12%)	4 (11.8%)
Media (N=14)	5 (13.5%)	5 (10.9%)	1 (2.0%)	3 (8.8%)
Civil society organisations (N=9)	3 (8.1%)	1 (2.2%)	2 (4.0%)	3 (8.8%)
Local experts (N=7)	2 (5.4%)	2 (4.3%)	3 (6.0%)	0 (0%)
Research institutions (N=6)	1 (2.7%)	0 (0%)	1 (2.0%)	4 (11.8%)
Farmers' groups (N=6)	2 (5.4%)	1 (2.2%)	1 (2.0%)	2 (5.9%)
Training and education institutions (N=3)	0 (0%)	1 (2.2%)	0 (0%)	2 (5.9%)
Books (N=3)	2 (5.4%)	1 (2.2%)	0 (0%)	0 (0%)
Development partners (N=2)	0 (0%)	1 (2.2%)	1 (2.0%)	0 (0%)
Barazas (N=1)	0 (0%)	1 (2.2%)	0 (0%)	0 (0%)
Field days (N=1)	0 (0%)	1 (2.2%)	0 (0%)	0 (0%)
Total (167)	37	46	50	34

**Appendix 53: Timeline of agriculture related activities in Kamunyange sub-location, Murinduko location, Mwea division**

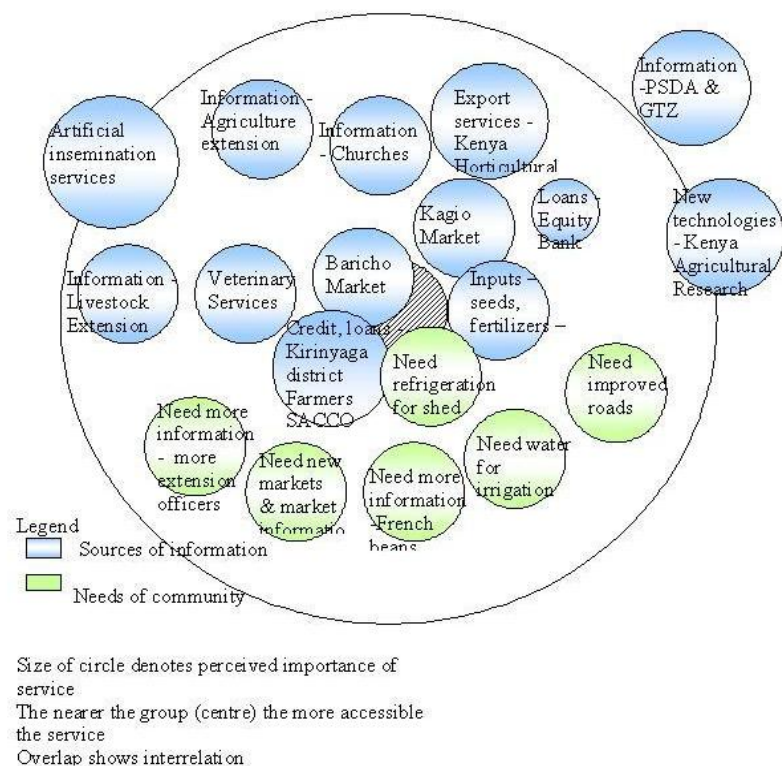
1962	Land demarcated - people allotted 20 acres, 10 acres, 5 acres Trees – Muthigiriri, Murama, Mraba, Mirera
1970s	Cotton growing Trees uprooted to give way to cotton Training by agricultural officers Diseases - bollworm, stains  <i>Changes</i> Shift to fast growing horticultural crops Small land sizes Cows and goats
1980s	Few <b>extension officers</b> in offices only French beans introduced
2003	<b>Extension</b> officers started visiting farmers Cotton spraying by <b>Ministry of Agriculture</b> (payment deducted at sale) More <b>markets</b> and <b>traders</b> for farm produce <b>Inooro radio</b> - agricultural programmes (mostly men listen - women are busy) <b>Brokers</b> spoil market and give wrong information
2005	Bananas and mangoes produced for sale <b>Farmers' groups</b> engaged in cotton, tree nursery, goats, chickens Most groups are merry go rounds <b>Youth groups</b> keeping dairy goats Mwienderi water project Membership in several groups based on interest
2006	Irrigation Dry paddy introduced
2007	<b>Equity Bank</b> provided loans to cotton farmers Money paid to <b>agrochemical company</b> (Juanco) to <b>spray cotton</b> Repayment problems due to drought



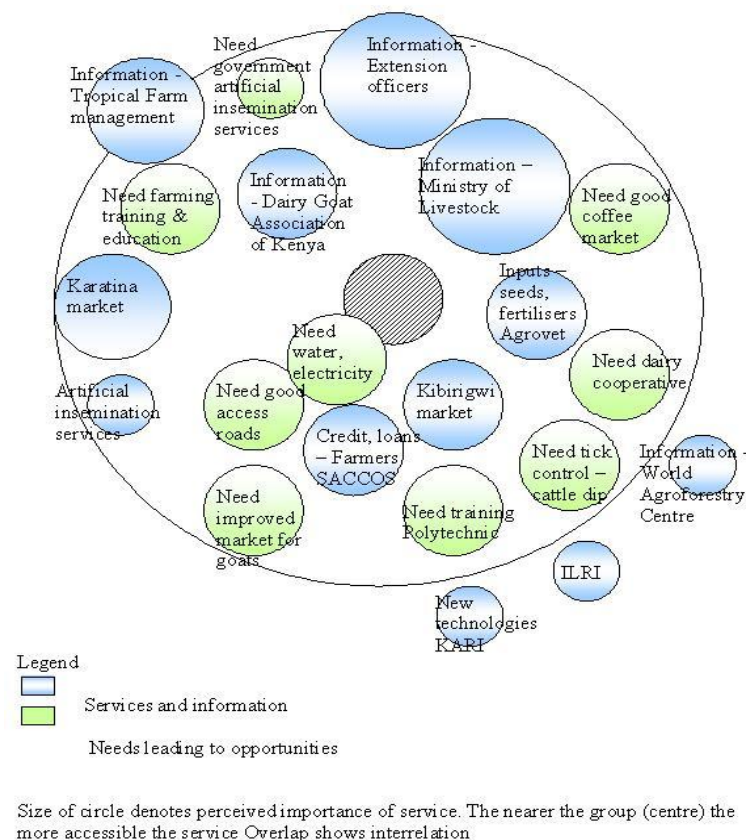
**Appendix 54: Timeline of agriculture related activities in Kithumbu sub-location, Mwerua location, Ndia division**

?	People lived in villages - Kiangai, Kanjai Some people were left in the village after demarcation
1970s	Crops - beans, maize, millets, cowpeas Indigenous cattle, goats, chickens <i>Gikware</i> disease affected maize
?	Famine " <i>Wimenye</i> "
Late 1970s	Coffee farming - land inspected and approved by <b>Ministry of Agriculture</b>
1980s	Irrigation - water from Rwamuthambi river
1984	Famine - people, animals died, children stopped schooling to search for jobs Government brought yellow maize " <i>Gathikari</i> "
Late 1980s	Kampala banana variety introduced - brought by <b>drivers</b> travelling to Uganda Required manure and plenty of water
Early 1990s	Tissue culture bananas introduced by <b>agricultural extension</b> officer
Mid 1990s	<b>Horticultural exporting companies</b> introduced scheme of issuing seeds to farmers (deducted after sale) French beans bought by exporting companies, <b>brokers</b> Tomatoes sold to <b>brokers</b> , Kagio market
Late 1990s	Artificial insemination introduced by government (now privatised) <b>Agricultural extension</b> helped farmers to produce French beans and tomatoes  <i>Changes</i> Smaller land sizes because of subdivision Extension officers ceased to operate / rarely seen No gender disparities between genders
2000s	<b>Radio</b> broadcasting agricultural information Agricultural production improved (new technologies adopted) Training and information from agrochemical companies, field days, barazas
2007	Army worm invasion  <b>Ministry of Agriculture</b> provided free chemicals to control the army worms.
Suggestions	Make available market and price information Provide information on dairy goat and dairy cow farming Assist with irrigation to help establish other enterprises Provide information on new technologies

**Appendix 55: Agricultural service and opportunity map for Gitaku sub-location, Mwerua location, Ndia division**



**Appendix 56: Agricultural services and opportunity map Kariini sub-location, Kiine location, Ndia division**

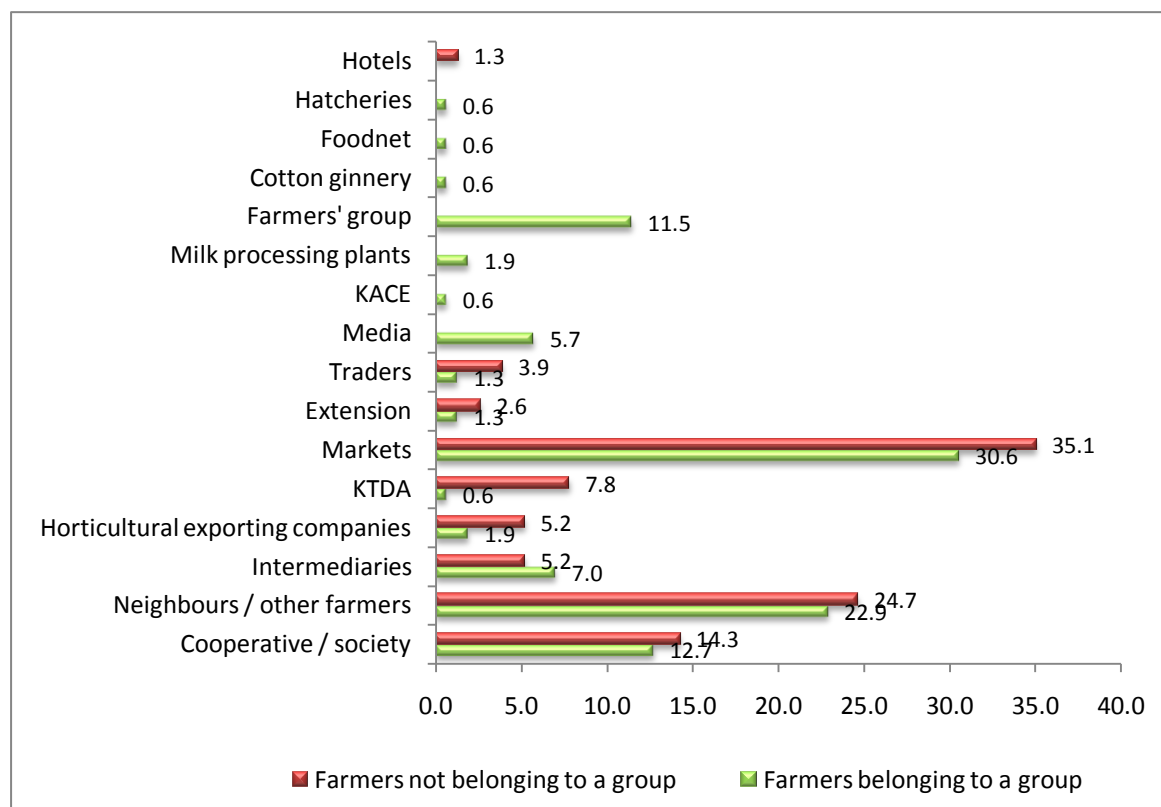


**Appendix 57: Main sources of market and price information used by farmers' groups by division**  
N=82

<b>Count (% of Total) Sources</b>	<b>Divisions</b>				<b>District Kirinyaga</b>
	<b>Central</b>	<b>Gichugu</b>	<b>Mwea</b>	<b>Ndia</b>	
Visiting local markets	5 (4.6%)	2 (1.8%)	8 (7.3%)	5 (4.6%)	20 (18.3%)
Asking intermediaries / middlemen / agents	3 (2.8%)	3 (2.8%)	7 (6.4%)	2 (1.8%)	15 (13.8%)
Asking farmers' group	4 (3.7%)	2 (1.8%)	1 (0.9%)	0 (0%)	7 (6.4%)
Through group officials or members	2 (1.8%)	1 (0.9%)	1 (0.9%)	0 (0%)	4 (3.7%)
From horticultural exporting companies	0 (0%)	0 (0%)	5 (4.6%)	0 (0%)	3 (2.8%)
From the cotton ginnery in Mwea	0 (0%)	0 (0%)	3 (2.8%)	0 (0%)	3 (2.8%)
We contacted the DGAK	1 (.9%)	0 (0%)	2 (1.8%)	0 (0%)	3 (2.8%)
From the media	2 (1.8%)	0 (0%)	0 (0%)	0 (0%)	2 (1.8%)
Asking coffee factory / cooperative / societies	0 (0%)	1 (0.9%)	0 (0%)	1 (0.9%)	2 (1.8%)
From HCDA	0 (0%)	0 (0%)	0 (0%)	2 (1.8%)	2 (1.8%)
From the internet	0 (0%)	1 (0.9%)	0 (0%)	1 (0.9%)	2 (1.8%)
Kenya Forest Service / Forestry Officer	1 (.9%)	0 (0%)	0 (0%)	1 (0.9%)	2 (1.8%)
Through the CDF (made offer)	0 (0%)	2 (1.8%)	0 (0%)	0 (0%)	2 (1.8%)
Calculating input costs and adding a profit	0 (0%)	2 (1.8%)	0 (0%)	0 (0%)	2 (1.8%)
Cooperative / society	0 (0%)	0 (0%)	0 (0%)	1 (0.9%)	1 (0.9%)
Through barazas	0 (0%)	1 (.9%)	0 (0%)	0 (0%)	1 (0.9%)
Exhibitions and shows	0 (0%)	0 (0%)	0 (0%)	1 (0.9%)	1 (0.9%)
Visiting butcheries	0 (0%)	1 (0.9%)	0 (0%)	0 (0%)	1 (0.9%)
From USAID	0 (0%)	0 (0%)	1 (0.9%)	0 (0%)	1 (0.9%)
KARI	0 (0%)	0 (0%)	0 (0%)	1 (0.9%)	1 (.9%)
The World Agroforestry Centre	0 (0%)	0 (0%)	0 (0%)	1 (0.9%)	1 (0.9%)
Through meetings	0 (0%)	1 (.9%)	0 (0%)	0 (0%)	1 (0.9%)
Through TechnoServe	1 (0.9%)	0 (0%)	0 (0%)	0 (0%)	1 (0.9%)
Through Brookside	1 (0.9%)	0 (0%)	0 (0%)	0 (0%)	1 (0.9%)
Not yet searched for prices as a group	1 (0.9%)	0 (0%)	0 (0%)	1 (0.9%)	2 (1.8%)
Not yet sold milk as a group	0 (0%)	1 (.9%)	0 (0%)	0 (0%)	1 (0.9%)
<b>Total</b>	<b>24 (22%)</b>	<b>29 (26.6%)</b>	<b>35 (32.1%)</b>	<b>21(19.3%)</b>	<b>109 (100%)</b>

# Appendix 58: Main sources of market information for enterprise ranked priority number two by individual farmers

N=94 for farmers belonging to a group, N=56 for farmers not belonging to a group



**Appendix 59: A gender analysis of the main sources of market and price information of farmers belonging to a group for the enterprises ranked priority number one and two**

N=99 for enterprise 1, N=94 for enterprise 2

Sources	Enterprise 1		N (Enterprise 2)	Enterprise 2	
	Male	Female		Male	Female
Count / % within gender					
Markets (N=42)	24 (23.1%)	18 (28.1%)	(48)	28 (29.8%)	20 (31.7%)
Neighbours (N=32)	17 (16.3%)	15 (23.4%)	(36)	19 (20.2%)	17 (27%)
Cooperative / factory / society (N=21)	17 (16.3%)	4 (6.3%)	(20)	13 (13.8%)	7 (11.1%)
Farmers' group (N=25)	16 (15.4%)	9 (14.1%)	(18)	11 (11.7%)	7 (11.1)
Intermediaries (8)	2 (1.9%)	6 (9.4%)	(11)	6 (6.4%)	5 (7.9%)
Media (N=9)	9 (8.7%)	0 (0%)	(9)	9 (9.6%)	0 (0%)
Milk processing plants			(3)	2 (2.1%)	1 (1.6%)
Horticultural exporting companies (N=7)	4 (3.8%)	3 (4.7%)	(3)	2 (2.1%)	1 (1.6%)
Extension (N=4)	2 (1.9%)	2 (3.1%)	(2)	0 (0%)	2 (3.2%)
Traders (N=4)	2 (1.9%)	2 (3.1%)	(2)	0 (0%)	2 (3.2%)
KTDA (N=10)	8 (7.7%)	2 (3.1%)	(1)	1 (1.1%)	0 (0%)
KACE (N=2)	1 (1%)	1 (1.6%)	(1)	1 (1.1%)	0 (0%)
NAFIS (N=1)	1 (1%)	0 (0%)			
DGAK (N=1)	0 (0%)	1 (1.6%)			
Rice mill (N=1)	0 (0%)	1 (1.6%)			
Foodnet (N=1)	1 (1%)	0 (0%)	(1)	1 (1.1%)	0 (0%)
Cotton ginnery			(1)	0 (0%)	1 (1.6%)
Hatcheries			(1)	1 (1.1%)	0 (0%)
Total (168 responses)	104	64	(157)	94	63

**Appendix 60: A gender analysis of the main sources of market and price information of farmers not belonging to a group for the enterprises ranked priority number one and two**

N=67 for enterprise one, N=56 for enterprise two

Count (% within gender) Sources / (N enterprise 1)	Enterprise 1			Enterprise 2	
	Male	Female	<i>N (Enterprise 2)</i>	Male	Female
Markets (N=33)	19 (29.7%)	14 (34.1%)	(27)	16 (34%)	11 (36.7%)
Neighbours (N=22)	13 (20.3%)	9 (22%)	(19)	10 (21.3%)	9 (30%)
Cooperative / factory / society (N=19)	12 (18.8%)	7 (17.1%)	(11)	8 (17.0%)	3 (10%)
KTDA (N=10)	5 (7.8%)	5 (12.2%)	(6)	6 (12.8%)	0 (0%)
Intermediaries (traders) (N=9)	4 (6.3%)	5 (12.2%)	(4)	3 (6.4%)	1 (3.3%)
Media (N=5)	5 (7.8%)	0 (0%)			
Horticultural exporting companies (N=2)	2 (3.1%)	0 (0%)	(4)	1 (2.1%)	3 (10%)
Traders (N=2)	1 (1.6%)	1 (2.4%)	(3)	1 (2.1%)	2 (6.7%)
KACE (N=1)	1 (1.6%)	0 (0%)			
Milk processing plants (N=1)	1 (1.6%)	0 (0%)			
NAFIS (N=1)	1 (1.6%)	0 (0%)			
Hotels			(1)	1 (2.1%)	0 (0%)
Extension			(2)	1 (2.1%)	1 (3.3%)
Total (105 responses)	64	41	(77)	47	30

**Appendix 61: Analysis of specific sources of information and knowledge and the criteria used by farmers' groups in determining main sources**

N=82

	Criteria for determining the main sources						Total
	Quality of information	Convenience availability / proximity	Provision of current information	Follow-up /backstopping	Cost of information	They visit the group	
Extension (public sector)	27 (13.7%)	38 (19.3%)	1 (0.5%)	4 (2%)	6 (3%)	3 (1.5%)	79 (40.1%)
Private sector	3 (1.5%)	26 (13.2%)	1 (0.5%)	3 (1.5%)	1 (0.5%)	2 (1%)	36 (18.3%)
Neighbour	3 (1.5%)	19 (9.6%)	0 (0%)	2 (1%)	0 (0%)	1 (0.5%)	25 (12.7%)
Media	4 (2%)	10 (5.1%)	1 (0.5%)	0 (0%)	0 (0%)	0 (0%)	15 (7.6%)
Civil society organisations	4 (2%)	5 (2.5%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	9 (4.6%)
Research institutions	3 (1.5%)	1 (0.5%)	0 (0%)	3 (1.5%)	0 (0%)	1 (0.5%)	8 (4.1%)
Local experts	1 (0.5%)	5 (2.5%)	1 (0.5%)	0 (0%)	1 (0.5%)	0 (0%)	8 (4.1%)
Farmers' groups	2 (1%)	4 (2%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	6 (3%)
Books	1 (0.5%)	2 (1%)	1 (0.5%)	0 (0%)	0 (0%)	0 (0%)	4 (2%)
Training and education institutions	1 (0.5%)	2 (1%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	3 (1.5%)
Development partners	1 (0.5%)	1 (0.5%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	2 (1%)
Barazas	0 (0%)	1 (0.5%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	1 (0.5%)
Field days	0 (0%)	1 (0.5%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	1 (0.5%)
Total	50 (25.4%)	115 (58.4%)	5 (2.5%)	12 (6.1%)	8 (4.1%)	7 (3.6%)	197 (100%)

# Appendix 62: Analysis of specific sources and the criteria used by farmers belonging to a group in determining main sources

N=97

Source	Criteria for determining the main sources					They visit the group	Total
	Count (% of Total)	Quality of information	Convenience availability / proximity	Provision of current information	Follow-up / backstopping	Cost of information	
Extension officers	22 (8.4%)	22 (8.4%)	48 (18.4%)	3 (1.1%)	1 (0.4%)	1 (0.4%)	77 (29.5%)
Private sector	13 (5.0%)	13 (5.0%)	38 (14.6%)	5 (1.9%)	0 (0%)	1 (0.4%)	57 (21.8%)
Neighbours / friends	8 (3.1%)	8 (3.1%)	30 (11.5%)	0 (0%)	0 (0%)	0 (0%)	38 (14.6%)
Media	7 (2.7%)	7 (2.7%)	17 (6.5%)	0 (0%)	0 (0%)	0 (0%)	24 (9.2%)
Civil society organisations	5 (1.9%)	5 (1.9%)	7 (2.7%)	3 (1.1%)	0 (0%)	0 (0%)	16 (6.1%)
Groups and group members	2 (0.8%)	2 (0.8%)	11 (4.2%)	1 (0.4%)	0 (0%)	0 (0%)	14 (5.4%)
Training and education institutions	2 (0.8%)	2 (0.8%)	6 (2.3%)	0 (0%)	0 (0%)	0 (0%)	8 (3.1%)
Research institutions	2 (0.8%)	2 (0.8%)	3 (1.1%)	0 (0%)	0 (0%)	1 (0.4%)	6 (2.3%)
Books	2 (0.8%)	2 (0.8%)	4 (1.5%)	0 (0%)	0 (0%)	0 (0%)	6 (2.3%)
Own knowledge / experience	0 (0%)	0 (0%)	5 (1.9%)	0 (0%)	0 (0%)	0 (0%)	5 (1.9%)
Intermediaries	1 (0.4%)	1 (0.4%)	3 (1.1%)	0 (0%)	0 (0%)	0 (0%)	4 (1.5%)
Barazas	0 (0%)	0 (0%)	4 (1.5%)	0 (0%)	0 (0%)	0 (0%)	4 (1.5%)
Field days	0 (0%)	0 (0%)	1 (0.4%)	0 (0%)	0 (0%)	0 (0%)	1 (0.4%)
Market places	0 (0%)	0 (0%)	1 (0.4%)	0 (0%)	0 (0%)	0 (0%)	1 (0.4%)
Total	64 (24.5%)	64 (24.5%)	178 (68.2%)	12 (4.6%)	1 (0.4%)	2 (0.8%)	261 (100%)



**Appendix 63: Analysis of specific sources of information and knowledge and the criteria used by farmers not belonging to a group in determining main sources**

N=68

Source	Criteria for considering source to be main sources					Total
	Quality of information	Convenience availability / proximity	Provision of current information	Follow-up / backstopping	They visit the group	
Extension services	18 (14.4%)	14 (11.2%)	0 (0%)	1 (0.8%)	0 (0%)	33 (26.4%)
Neighbours, other farmers, relatives, friends	6 (4.8%)	24 (19.2%)	0 (0%)	1 (0.8%)	1 (0.8%)	32 (25.6%)
Private sector	4 (3.2%)	18 (14.4%)	0 (0%)	1 (0.8%)	0 (0%)	23 (18.4%)
Media (radio / TV)	2 (1.6%)	10 (8.0%)	0 (0%)	0 (0%)	0 (0%)	12 (9.6%)
Own knowledge / experience	2 (1.6%)	4 (3.2%)	0 (0%)	0 (0%)	0 (0%)	6 (4.8%)
Visits / tours	0 (0%)	3 (2.4%)	1 (0.8%)	0 (0%)	0 (0%)	4 (3.2%)
Civil society organisations	1 (0.8%)	2 (1.6%)	0 (0%)	0 (0%)	0 (0%)	3 (2.4%)
Books /periodicals	0 (0%)	3 (2.4%)	0 (0%)	0 (0%)	0 (0%)	3 (2.4%)
Training and education institutions	1 (0.8%)	2 (1.6%)	0 (0%)	0 (0%)	0 (0%)	3 (2.4%)
Research institutions	1 (0.8%)	1 (0.8%)	0 (0%)	0 (0%)	0 (0%)	2 (1.6%)
Seminars	2 (1.6%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	2 (1.6%)
Barazas	0 (0%)	1 (0.8%)	0 (0%)	0 (0%)	0 (0%)	1 (0.8%)
Farmers' group	1 (0.8%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	1 (0.8%)
Total	38 (30.4%)	82 (65.6%)	1 (0.8%)	3 (2.4%)	1 (0.8%)	125 (100%)

**Appendix 64: Ease of accessing information from specific sources for the enterprise ranked priority number one by farmers' groups**  
N=77 groups

Sources	How easy is it for the group to access the main sources for the enterprise ranked priority number one?				
	1= Very easy	2	3	4	5=Very difficult
Extension (N=49)	19 (38.8%)	8 (16.3%)	12 (24.5%)	3 (6.1%)	7 (14.3%)
Private sector (N=29)	12 (41.4%)	4 (13.8%)	10 (34.5%)	1 (3.4%)	2 (6.9%)
Neighbour (N=10)	4 (40.0%)	1 (10.0%)	1 (10.0%)	3 (30.0%)	1 (10.0%)
Local experts (N=6)	3 (50.0%)	0 (0%)	2 (33.3%)	1 (16.7%)	0 (0%)
Media (N=5)	4 (80.0%)	0 (0%)	0 (0%)	1 (20.0%)	0 (0%)
Training and education institutions (N=4)	2 (50%)	1 (25.0%)	1 (25.0%)	0 (0%)	0 (0%)
Farmers' groups (N=4)	1 (25%)	0 (0%)	0 (0%)	3 (75.0%)	0 (0%)
Civil society organisations (N=3)	2 (66.7%)	0 (0%)	0 (0%)	1 (33.3%)	0 (0%)
Research institutions (N=3)	0 (0%)	0 (0%)	1 (33.3%)	0 (0%)	2 (66.7%)
Development partners (N=2)	1 (50.0%)	1 (50.0%)	0 (0%)	0 (0%)	0 (0%)
Field days (N=1)	1 (100%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)
Own knowledge (N=1)	1 (100%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)
Visits and tours (N=1)	0 (0%)	1 (100%)	0 (0%)	0 (0%)	0 (0%)
Total (118)	50	16	27	13	12

**Appendix 65: Ease of accessing information from the main sources of information and knowledge for the enterprise ranked priority number one by farmers belonging to a group**  
N=95

Sources	How easy is it for farmers belonging to a group to access the main sources for enterprise 1?				
	1= Very easy	2	3	4	5=Very difficult
Extension officers (N=61)	34 (55.7%)	6 (9.8%)	17 (27.9%)	3 (4.9%)	1 (1.6%)
Private sector (N=44)	25 (56.8%)	4 (9.1%)	10 (22.7%)	2 (4.5%)	3 (6.8%)
Neighbours (N=33)	12 (36.4%)	9 (27.3%)	6 (18.2%)	4 (12.1%)	2 (6.1%)
Media (N=19)	9 (47.4%)	2 (10.5%)	6 (31.6%)	2 (10.5%)	0 (0%)
Civil society organisations (N=17)	9 (52.9%)	3 (17.6%)	4 (23.5%)	1 (5.9%)	0 (0%)
Groups and group members (N=12)	3 (25.0%)	2 (16.7%)	6 (50.0%)	1 (8.3%)	0 (0%)
Training and education institutions (N=8)	5 (62.5%)	0 (0%)	1 (12.5%)	2 (25.0%)	0 (0%)
Research institutions (N=5)	3 (60.0%)	1 (20.0%)	0 (0%)	1 (20.0%)	0 (0%)
Books (N=4)	1 (25.0%)	1 (25.0%)	1 (25.0%)	1 (25.0%)	0 (0%)
Own knowledge / experience (N=3)	1 (33.3%)	0 (0%)	1 (33.3%)	0 (0%)	1 (33.3%)
Intermediaries (N=3)	1 (33.3%)	0 (0%)	1 (33.3%)	0 (0%)	1 (33.3%)
Barazas (N=2)	1 (50.0%)	0 (0%)	1 (50.0%)	0 (0%)	0 (0%)
Field days (N=1)	1 (100%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)
Market places (N=1)	0 (0%)	1 (100%)	0 (0%)	0 (0%)	0 (0%)
Total (213)	105	29	54	17	8

**Appendix 66: Ease of accessing information from the main sources of information and knowledge for the enterprise ranked priority number one by farmers not belonging to a group**

N=64

Total) Sources	Count (% of How easy is it for farmers not belonging to a group to access the main sources for enterprise ranked priority number one?				
	1= Very easy	2	3	4	5=Very difficult
Extension services (N=32)	11 (34.4%)	5 (15.6%)	8 (25.0%)	3 (9.4%)	5 (15.6%)
Neighbours (N=30)	10 (33.3%)	7 (23.3%)	5 (16.7%)	1 (3.3%)	7 (23.3%)
Private sector (N=23)	10 (43.5%)	5 (21.7%)	5 (21.7%)	3 (13.0%)	0 (0%)
Media (radio / TV) (N=12)	4 (33.3%)	4 (33.3%)	0 (0%)	1 (8.3%)	3 (25.0%)
Visits / tours (N=5)	2 (40.0%)	3 (60.0%)	0 (0%)	0 (0%)	0 (0%)
Books /periodicals (N=4)	1 (25.0%)	1 (25.0%)	0 (0%)	2 (50.0%)	0 (0%)
Own knowledge / experience (N=4)	1 (25.0%)	2 (50.0%)	0 (0%)	1 (25.0%)	0 (0%)
Research institutions (N=3)	1 (33.3%)	1 (33.3%)	1 (33.3%)	0 (0%)	0 (0%)
Training and education institutions (N=3)	1 (33.3%)	0 (0%)	1 (33.3%)	0 (0%)	1 (33.3%)
Civil society organisations (N=3)	2 (66.7%)	0 (0%)	1 (33.3%)	0 (0%)	0 (0%)
Seminars (N=1)	0 (0%)	1 (100%)	0 (0%)	0 (0%)	0 (0%)
Barazas (N=1)	0 (0%)	0 (0%)	0 (0%)	1 (100%)	0 (0%)
Farmers' group (N=1)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	1 (100%)
Total (122)	43	29	21	12	17

**Appendix 67: Reliability of advice, information and knowledge obtained from key sources for the enterprise ranked priority number one by farmers' groups**

N=75

Sources	How reliable is the information or advice you get for each of the sources of agricultural enterprise 1?				
	1= Very reliable	2	3	4	5=Not reliable
Extension (N=48)	28 (58.3%)	10 (20.8%)	6 (12.5%)	3 (6.3%)	1 (2.1%)
Private sector (N=28)	11 (39.3%)	7 (25.0%)	6 (21.4%)	2 (7.1%)	2 (7.1%)
Neighbour (N=8)	2 (25%)	4 (50.0%)	1 (12.5%)	1 (12.5%)	0 (0%)
Local experts (N=5)	4 (80%)	1 (20%)	0 (0%)	0 (0%)	0 (0%)
Media (N=5)	3 (60%)	0 (0%)	2 (40%)	0 (0%)	0 (0%)
Farmers' groups (N=4)	1 (25%)	1 (25%)	2 (50%)	0 (0%)	0 (0%)
Training and education institutions (N=4)	2 (50.0%)	1 (25.0%)	0 (0%)	1 (25.0%)	0 (0 (0%))
Research institutions (N=3)	1 (33.3%)	2 (66.7%)	0 (0%)	0 (0%)	0 (0%)
Civil society organisations (N=3)	2 (66.7%)	0 (0%)	0 (0%)	1 (33.3%)	0 (0%)
Development partners (N=2)	1 (50.0%)	1 (50.0%)	0 (0%)	0 (0%)	0 (0%)
Field days (N=1)	1 (100%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)
Own knowledge (N=1)	0 (0%)	0 (0%)	1 (100%)	0 (0%)	0 (0%)
Visits and tours (N=1)	1 (100%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)
Total	57	27	18	8	3

**Appendix 68: Reliability of advice, information and knowledge obtained from the main sources for the enterprise ranked priority number one by farmers belonging to a group**  
N=95

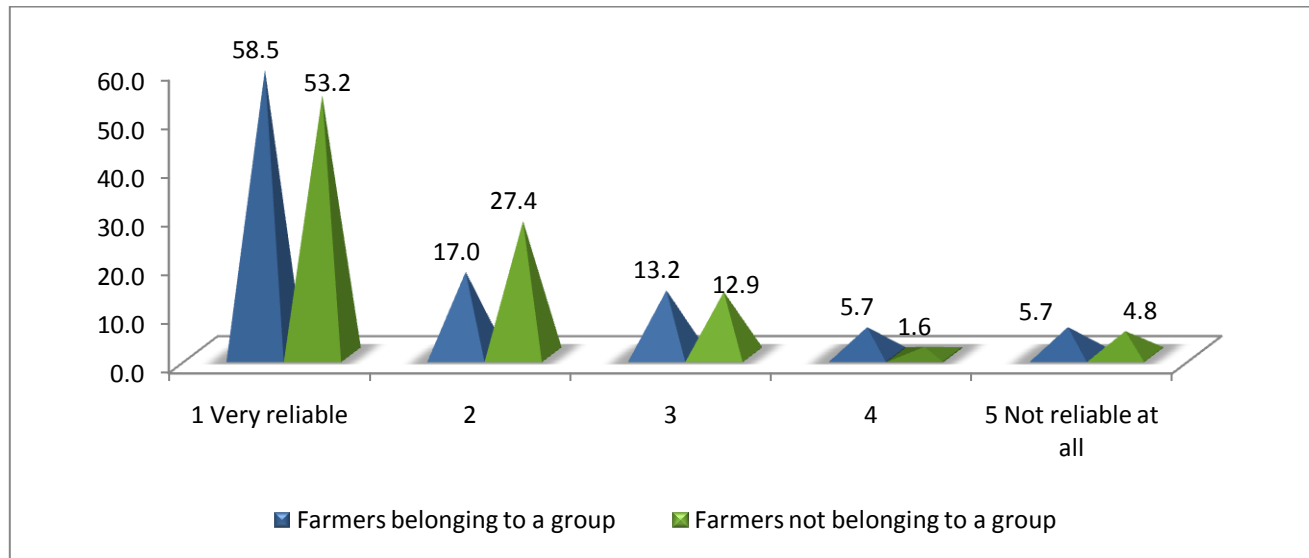
Sources	How reliable is the information or advice you get for each of the sources of agricultural enterprise 1?				
	1= Very reliable	2	3	4	5=Not reliable
Extension officers (N=61)	44 (72.1%)	10 (16.4%)	6 (9.8%)	0 (0%)	1 (1.6%)
Private sector (N=44)	31 (70.5%)	2 (4.5%)	5 (11.4%)	3 (6.8%)	3 (6.8%)
Neighbours (N=33)	14 (42.4%)	10 (30.3%)	5 (15.2%)	2 (6.1%)	2 (6.1%)
Media (N=19)	11 (57.9%)	6 (31.6%)	2 (10.5%)	0 (0%)	0 (0%)
Civil society organisations (N=17)	14 (82.4%)	3 (17.6%)	0 (0%)	0 (0%)	0 (0%)
Groups and group members (N=12)	3 (25.0%)	5 (41.7%)	2 (16.7%)	1 (8.3%)	1 (8.3%)
Training and education institutions (N=8)	8 (100%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)
Research institutions (N=5)	3 (60%)	2 (40%)	0 (0%)	0 (0%)	0 (0%)
Books (N=4)	1 (25.0%)	3 (75.0%)	0 (0%)	0 (0%)	0 (0%)
Intermediaries (N=3)	2 (66.7%)	0 (0%)	0 (0%)	0 (0%)	1 (33.3%)
Own knowledge (N=3)	1 (33.3%)	0 (0%)	1 (33.3%)	0 (0%)	1 (33.3%)
Barazas (N=2)	1 (50%)	0 (0%)	1 (50%)	0 (0%)	0 (0%)
Field days (N=1)	1 (100%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)
Total (213)	134	41	23	6	9

**Appendix 69: Reliability of advice, information and knowledge obtained from primary sources of information for the enterprise ranked priority number one by farmers not belonging to a group**  
N=64

Sources	How reliable is the information or advice you get for each of the sources of agricultural enterprise ranked priority number one?				
	1= Very reliable	2	3	4	5=Not reliable
Extension (N=30)	17 (56.7%)	10 (33.3%)	2 (6.7%)	0 (0%)	1 (3.3%)
Neighbours (N=30)	16 (53.3%)	6 (20%)	6 (20%)	0 (0%)	2 (6.7%)
Private sector (N=22)	11 (50%)	7 (31.8%)	2 (9.1%)	2 (9.1%)	0 (0%)
Media (radio / TV) (N=12)	7 (58.3%)	4 (33.3%)	0 (0%)	0 (0%)	1 (8.3%)
Own knowledge (N=5)	2 (40%)	3 (60%)	0 (0%)	0 (0%)	0 (0%)
Visits / tours (N=5)	2 (40%)	2 (40%)	1 (20%)	0 (0%)	0 (0%)
Books /periodicals (N=4)	3 (75%)	1 (25%)	0 (0%)	0 (0%)	0 (0%)
Research institutions (N=3)	3 (100%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)
Civil society organisations (N=3)	3 (100%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)
Training and education institutions (N=2)	2 (100%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)
Seminars (N=1)	1 (100%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)
Barazas (N=1)	1 (100%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)
Farmers' group (N=1)	1 (100%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)
Total (119)	69	33	11	2	4

## Appendix 70: Reliability of information, advice and knowledge farmers get from key sources of the enterprise ranked priority number one

N=90 for farmers belonging to a group, and N=53 for farmers not belonging to a group



## Appendix 71: Usefulness of advice, information and knowledge obtained from specific sources for the enterprise ranked priority number one by farmers' groups

N=74

Sources	How useful is the information or advice your group gets for each of the sources of agricultural enterprise 1?				
	1= Very useful	2	3	4	5=Not useful at all
Extension (N=47)	34 (72.3%)	6 (12.8%)	4 (8.5%)	0 (0%)	3 (6.4%)
Private sector (N=27)	15 (55.6%)	8 (29.6%)	1 (3.7%)	2 (7.4%)	1 (3.7%)
Neighbour (N=8)	4 (50%)	2 (25%)	2 (25%)	0 (0%)	0 (0%)
Local experts (N=5)	4 (80%)	1 (20%)	0 (0%)	0 (0%)	0 (0%)
Media (N=5)	3 (60%)	0 (0%)	2 (40%)	0 (0%)	0 (0%)
Training and education institutions (N=4)	1 (25%)	2 (50%)	0 (0%)	0 (0%)	1 (25%)
Farmers' groups (N=4)	1 (25%)	0 (0%)	3 (75%)	0 (0%)	0 (0%)
Research institutions (N=3)	3 (100%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)
Civil society organisations (N=3)	2 (66.7%)	1 (33.3%)	0 (0%)	0 (0%)	0 (0%)
Development partners (N=2)	2 (100%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)
Field days (N=1)	1 (100%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)
Own knowledge (N=1)	0 (0%)	0 (0%)	1 (100%)	0 (0%)	0 (0%)
Visits and tours (N=1)	1 (100%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)
Total (111)	71	20	13	2	5

**Appendix 72: Usefulness of advice, information and knowledge obtained from specific sources for the enterprise ranked priority number one by farmers belonging to a group**  
N=93

Sources	How useful is the information or advice you get for each of the sources of agricultural enterprise 1?				
	1= Very useful	2	3	4	5=Not useful
Extension (N=60)	46 (76.7%)	7 (11.7%)	6 (10.0%)	0 (0%)	1 (1.7%)
Private sector (N=43)	32 (74.4%)	2 (4.7%)	7 (16.3%)	1 (2.3%)	1 (2.3%)
Neighbours (N=31)	16 (51.6%)	7 (22.6%)	8 (25.8%)	0 (0%)	0 (0%)
Media (N=19)	11 (57.9%)	5 (26.3%)	3 (15.8%)	0 (0%)	0 (0%)
Civil society organisations (N=16)	11 (68.8%)	4 (25.0%)	1 (6.3%)	0 (0%)	0 (0%)
Groups and group members (N=12)	6 (50%)	2 (16.7%)	4 (33.3%)	0 (0%)	0 (0%)
Training and education institutions (N=8)	8 (100%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)
Research institutions (N=5)	2 (40%)	2 (40.0%)	1 (20%)	0 (0%)	0 (0%)
Books (N=4)	2 (50%)	2 (50%)	0 (0%)	0 (0%)	0 (0%)
Intermediaries (N=3)	2 (66.7%)	0 (0%)	0 (0%)	1 (33.3%)	0 (0%)
Own knowledge (N=2)	1 (50%)	0 (0%)	1 (50%)	0 (0%)	0 (0%)
Barazas (N=2)	1 (50%)	0 (0%)	1 (50%)	0 (0%)	0 (0%)
Field days (N=1)	1 (100%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)
Market places (N=1)	0 (0%)	0 (0%)	1 (100%)	0 (0%)	0 (0%)
Total (207)	139	31	33	2	2

**Appendix 73: Usefulness of advice, information and knowledge obtained from specific sources for the enterprise ranked priority number one by farmers not belonging to a group**  
N=64

Main sources	How useful is the information or advice you get for each of the sources of agricultural enterprise 1?				5=Not useful at all
	1=Very useful	2	3	4	
Extension services (N=30)	22 (73.3%)	6 (20%)	1 (3.3%)	1 (3.3%)	0 (0%)
Neighbours (N=28)	15 (53.6%)	4 (14.3%)	5 (17.9%)	3 (10.7%)	1 (3.6%)
Private sector (N=22)	14 (63.6%)	5 (22.7%)	3 (13.6%)	0 (0%)	0 (0%)
Media (radio / TV) (N=11)	9 (81.8%)	1 (9.1%)	0 (0%)	1 (9.1%)	0 (0%)
Visits / tours (N=5)	4 (80%)	0 (0%)	1 (20.0%)	0 (0%)	0 (0%)
Books /periodicals (N=4)	3 (75%)	1 (25.0%)	0 (0%)	0 (0%)	0 (0%)
Own knowledge (N=4)	2 (50%)	0 (0%)	1 (25%)	1 (25%)	0 (0%)
Training and education institutions (N=3)	3 (100)	0 (0%)	0 (0%)	0 (0%)	0 (0%)
Research institutions (N=3)	3 (100)	0 (0%)	0 (0%)	0 (0%)	0 (0%)
Civil society organisations (N=3)	3 (100)	0 (0%)	0 (0%)	0 (0%)	0 (0%)
Seminars (N=1)	1 (100)	0 (0%)	0 (0%)	0 (0%)	0 (0%)
Barazas (N=1)	1 (100)	0 (0%)	0 (0%)	0 (0%)	0 (0%)
Farmers' group (N=1)	1 (100)	0 (0%)	0 (0%)	0 (0%)	0 (0%)
Total (116)	81	17	11	6	1

**Appendix 74: Relevance of information and knowledge obtained from main sources for the enterprise ranked priority number one by farmers' groups**  
N=72

Source	To what extent is the information available from main sources relevant to the needs of farmers' group for enterprise ranked priority number one?				
	5= Not relevant at all	4	3	2	1=Very relevant
Extension (N=46)	2 (4.3%)	1 (2.2%)	4 (8.7%)	7 (15.2%)	32 (69.6%)
Private sector (N=26)	3 (11.5%)	2 (7.7%)	1 (3.8%)	7 (26.9%)	13 (50.0%)
Neighbour (N=8)	0 (0%)	0 (0%)	3 (37.5%)	2 (25.0%)	3 (37.5%)
Media (N=5)	0 (0%)	0 (0%)	2 (40.0%)	0 (0%)	3 (60.0%)
Local experts (N=5)	0 (0%)	0 (0%)	0 (0%)	1 (20.0%)	4 (80.0%)
Farmers' groups (N=4)	0 (0%)	0 (0%)	3 (75.0%)	0 (0%)	1 (33.3%)
Training and education institutions (N=3)	0 (0%)	0 (0%)	0 (0%)	1 (33.3%)	2 (66.7%)
Research institutions (N=3)	1 (33.3%)	0 (0%)	0 (0%)	0 (0%)	2 (66.7%)
Civil society organisations (N=3)	1 (33.3%)	0 (0%)	1 (33.3%)	0 (0%)	1 (33.3%)
Development partners (N=2)	1 (50.0%)	0 (0%)	0 (0%)	1 (50.0%)	0 (0%)
Field days (N=1)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	1 (100%)
Own knowledge (N=1)	0 (0%)	0 (0%)	1 (100%)	0 (0%)	0 (0%)
Visits and tours (N=1)	0 (0%)	0 (0%)	0 (0%)	1 (100%)	0 (0%)
Total	8	3	15	20	62

**Appendix 75: Relevance of information available from main sources of information and knowledge to the needs of farmers belonging to a group for enterprise ranked priority number two**  
N=83

Source	To what extent is the information available from main sources relevant to the needs of farmers belonging to a group for enterprise 2?				
	1= Not relevant at all	2	3	4	5=Very relevant
Private sector (N=43)	29 (67.4%)	7 (16.3%)	5 (11.6%)	1 (2.3%)	1 (2.3%)
Extension (N=39)	28 (71.8%)	5 (12.8%)	4 (10.3%)	1 (2.6%)	1 (2.6%)
Neighbours(N=33)	15 (45.5%)	6 (18.2%)	8 (24.2%)	4 (12.1%)	0 (0%)
Media (N=17)	11 (64.7%)	2 (11.8%)	3 (17.6%)	1 (5.9%)	0 (0%)
Markets (N=9)	5 (55.6%)	1 (11.1%)	3 (33.3%)	0 (0%)	0 (0%)
Farmers' group (N=5)	1 (20.0%)	1 (20.0%)	2 (40.0%)	1 (20.0%)	0 (0%)
Books /periodicals (N=4)	2 (50.0%)	0 (0%)	1 (25.0%)	0 (0%)	1 (25.0%)
Intermediaries (N=4)	2 (50.0%)	1 (25.0%)	1 (25.0%)	0 (0%)	0 (0%)
Civil society organisations (N=3))	3 (100%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)
Visits / tours (N=3)	2 (66.7%)	0 (0%)	1 (33.3%)	0 (0%)	0 (0%)
Barazas (N=3)	1 (33.3%)	0 (0%)	1 (33.3%)	1 (33.3%)	0 (0%)
Training and education institutions (N=1)	1 (100%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)
Total (164)	100	23	29	9	3

**Appendix 76: Relevance of information available from main sources of information and knowledge to the needs of farmers not belonging to a group for the enterprise ranked priority number two**  
N=83

Source	To what extent is the information available relevant to your needs for agricultural enterprise 2?				
	5= Not relevant at all	4	3	2	1=Very relevant
Extension (N=25)	4 (16.0%)	1 (4.0%)	1 (4.0%)	7 (28%)	12 (48%)
Neighbours (N=17)	0 (0%)	0 (0%)	2 (11.8%)	7 (41.2%)	8 (47.1%)
Private sector (N=16)	3 (18.8%)	1 (6.3%)	2 (12.5%)	3 (18.8%)	7 (43.8%)
Own knowledge / experience (N=4)	0 (0%)	1 (25.0%)	0 (0%)	1 (25.0%)	2 (50.0%)
Visits / tours (N=3)	1 (33.3%)	0 (0%)	0 (0%)	1 (33.3%)	1 (33.3%)
Markets (N=2)	0 (0%)	0 (0%)	1 (50.0%)	0 (0%)	1 (50.0%)
Intermediaries (N=2)	0 (0%)	0 (0%)	0 (0%)	2 (100%)	0 (0%)
Media (radio / TV) (N=1)	0 (0%)	0 (0%)	0 (0%)	1 (100%)	0 (0%)
Books /periodicals (N=1)	1 (100%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)
Training and education institutions (N=1)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	1 (100%)
Civil society organisations (N=1)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	1 (100%)
Farmers' group (N=1)	0 (0%)	0 (0%)	0 (0%)	1 (100%)	0 (0%)
Elders (N=1)	0 (0%)	0 (0%)	0 (0%)	1 (100%)	0 (0%)
Demonstrations (N=1)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	1 (100%)
Total (76)	9	3	6	24	34

**Appendix 77: Inventory of primary agricultural actors in the four divisions of Kirinyaga district**

Actor	Key actor?	Division				Why / Why not?
		C e n t r a l	G i c h u g u	M w e a	N d I a	
<b>Research institutions (national)</b>						
Coffee Research Foundation	Yes	√	√	?	√	Provides information on improved coffee varieties and planting materials e.g. Ruiru 11 clones
Kenya Agricultural Research Institute (KARI) (Mwea, Embu, Thika, Muguga)	Yes	√	√	√	√	Generates new technologies and research services into new varieties, pests and diseases
Mwea Irrigation Agricultural Development Centre (MIAD)	Yes	√	√	√	√	MIAD is the research arm linked to the National Irrigation Board (NIB) (a parastatal). It carries out research on rice and supports the activities of NIB. Provides soil analysis services and improved rice varieties e.g. Nerica to farmers and carries out seed multiplication, as well as training and conference facilities
Tea Research Foundation	Yes	√	?	?	?	Conducts research on tea
<b>Education and Training institutions</b>						
<b>Universities</b>						



Jomo Kenyatta University of Agriculture and Technology (JKUAT)	Yes	√	√	?	√	Generates and provides research outputs, training and information to farmers (mushrooms, tissue culture banana, organic farming)
University of Nairobi		?	?	?	√	Provides training on value addition (avocados)
Wisconsin University		?	√	?	?	Provides training on processing of medicinal plants (Stinging nettle)
<i>Training institutions</i>						
Ahiti Ndoba Training Institute	Yes	√	√	?	?	Provides training on agriculture
Kamweti Agricultural Training Centre		√	√	√	√	Provides training to farmers on various aspects of crop and animal husbandry and demonstrations. Also provides seedlings and offers training and conference facilities
Ngong Agricultural Training Centre	Yes	√	√	?	?	Provides conference facilities, training and agricultural information (e.g. Bee keeping, rabbit rearing)
Wambugu Farm	Yes	√	?	?	?	Holds demonstrations and training to farmers
<i>Schools</i>						
Primary and secondary schools	Yes	√	?	?	?	Conducts training on agriculture, environment, agroforestry. Also provides hands-on experience to students through various clubs such as the 4-K, young farmers and environment clubs
<b>Government Ministries / Departments</b>						
Agricultural Information and Resource Centre (AIRC)	Yes	√	√	√	√	Provides agricultural information in print and electronic format. Produces farmer communication materials (print leaflets, handbooks, manuals), video, and radio programmes in English and vernacular languages. Also provides training and conference facilities and hosts a library and documentation centre
Forestry Department		√	√	x	?	Provides permits for use of forest resources (nursery establishment, bee hives), training on tree nursery establishment and seeds
Meteorological Department					√	Provides weather information but it lacks accuracy
Ministry of Agriculture - extension	Yes	√	√	√	√	Provides policy guidelines, disseminates research finding, provides agricultural advisory services to farmers, funding and human resources
Ministry of Cooperatives	Yes	√	√	√	√	Facilitates the establishment of cooperative societies
Ministry of Education	Yes	√	√	√	√	Provides education (agriculture & science) and supports the 4-K, Young Farmers Clubs, Wildlife and Environmental clubs)
Ministry of Fisheries	Yes	√	√	√	√	Provides information and advice on fish farming
Ministry of Gender, Youth, Culture and Social Development	Yes	√	√	√	√	Facilitates group formation, registration of groups, and conflict resolution in groups. Also facilitate training for groups
Ministry of Health	No	√	√	√	√	Provides nutrition and health related information
Ministry of Information	Yes	√	√	√	√	Provides policy information and supports initiatives on ICTs (digital villages)
Ministry of Land	Yes	√	√	√	√	Provides title deeds
Ministry of Livestock - extension	Yes	√	√	√	√	Disseminates research findings and provides livestock advisory services to farmers
Ministry of Local Government	Yes	√	√	√	√	Provides road and market infrastructure

Ministry of Roads and Public Works	Yes	√	√	√	√	Provides roads infrastructure to transport goods
Ministry of Water	Yes	√	√	√	√	Provides information on irrigation and licences for irrigation water
National Agricultural and Livestock Development Programme (NALEP)	Yes	√	√	√	√	Provides demand-driven livestock and agricultural extension services and promotes the establishment of common interest groups (CIGs). Provides support in conducting surveys to establish broad based needs and training. Manages the newly established National Agricultural Information System (NAFIS) that integrates voice technology (phone) with the internet to provide information to farmers
Office of the President	Yes	√	√	√	√	Provides security, arbitration over land cases and administrative information through barazas
<b><i>Parastatal institutions</i></b>						
Agricultural Finance Cooperation (AFC)	(see credit and microfinance institutions)					
Coffee Research Foundation (CRF)	(see research)					
Horticultural Crops Development Authority (HCDA)	Yes	√	√	√	√	Regulates horticultural markets and provides information on horticultural production and storage
Kenya Agricultural Research Institute (KARI)	(see research)					
Kenya Forest Services		?	√	?	?	Trains farmers on tree nursery establishment, collection and harvesting of seeds. Sometimes provides seeds to farmers.
National Cereals and Produce Board (NCPB)	Yes	√	√	√	√	Provides information on cereals storage and market for farmers cereals
National Irrigation Board (NIB)	Yes	X	x	√	x	Provides access to water for irrigation and water canals and facilitated the formation and management of water use associations
National Museums of Kenya (NMK) and KENRIK	No	?	?	?	?	Provides information on traditional medicinal plants and indigenous food plants but community not aware of the KENRIK resource centre
<b><i>Non-governmental organisations / associations (NGOs)</i></b>						
Africa Harvest	Yes	√	?	x	√	Introduces new technologies and facilitates linkages with government extension services
Action Aid	No	?	?	?	√	Provides information on water harvesting and storage
Community Empowerment and Enterprise Development through Cooperatives (CEEDCO)		√				
DrumNet	No	X	√	x	x	Introduces new technologies and supports farmers in horticultural production and marketing but later abandoned farmers when the passion fruit crop got diseased. Some staff members did not pay farmers for produce collected
Green Belt Movement	Yes	√	√	?	√	Provides information and training on environment conservation and tree planting

KENDAT	Yes / No	X	x	√	x	Provides training on draught animal care and market links to horticultural farmers / focus on donkeys
Kenya Institute of Organic Farming (KIOF)	Yes	√	√	√	√	Provides training and information to farmers on organic farming, mushroom, rabbits and sheep farming
SACDEP	Yes	X	x	x	√	Provides value addition training to banana producers
TechnoServe	Yes	√	?	?	?	Provides market links to banana growers
The International Small Group and Tree Planting Program (TIST)	Yes	√	√	?	?	Provides information and training on environment conservation and tree planting
World Vision	No	?	?	?	√	Provides information on shelter
<i>Associations</i>						
Dairy Goat Association of Kenya (DGAK)	Yes	√	√	√	√	Provides improved goats, dairy bucks, training, technical and market information
Focal Area Development Committee (FADC)	Yes	√	?	√	?	Provides information on bee keeping, honey processing markets and marketing
Highridge Banana Growers and Marketing Association (HBGMA)		?	?	√	?	Promotes production and marketing of tissue culture bananas by providing extension services, market information, access to tissue banana plantlets. HGMA also supports post harvest handling, transportation and marketing
Kenya National Federation of Agricultural Producers (KENFAP)	Yes	?	?	?	√	A membership organisation that provides agricultural information, policy and lobbying for farmers and improving linkages between actors (agricultural related and credit)
National Bee Keepers Association	Yes	√	?	?	?	Provides information on bee keeping, honey processing markets and marketing
Water Users Association	Yes	?	√	?	√	Provides information on efficient use of irrigation water
<b><i>Faith based organisations</i></b>						
Catholic Diocese	Yes	√	x	√	√	Provides extension services not addressed by government to marginalised groups
Catholic Relief Services (CRS)	Yes	√	x	x	√	Works with partners to provide innovation (metal silo in collaboration with Ministry of Agriculture and Farm Africa)
Christian Community Services (CCS)	Yes	√	?	√	√	Provides agricultural support, inputs, relief food, training and information to farmers
Churches	Yes	√	√	√	√	Provides agricultural support, training and information to farmers in the community. Some provided inputs such as seeds and planting material.
Organisation of African Institute and Churches (OAIC)		?	?	?	√	Provides us with Moringa Oleifera and Aloe vera seedlings
<b><i>Credit and micro finance institutions</i></b>						
Agricultural Finance Corporation (AFC)	Yes	√	√	√	√	Provides loans to farmers
Cooperative Bank	Yes	√	√	√	√	Provides credit facilities to farmers and traders
Equity Bank	Yes	√	√	√	√	Provides credit facilities to farmers and traders
Family Finance Bank	Yes	√	√	√	√	Provides credit facilities to farmers and traders
Kenya Commercial Bank	Yes	√	√	√	√	Provides credit facilities to farmers and traders

Kenya Women Finance Trust	Yes	√	√	√	√	Provides credit facilities to farmers and traders
Kirinyaga District Farmers Union	Yes	√	√	√	√	Provides loans to farmers and agricultural traders
KREP	Yes	?	?	?	√	Provides loans to farmers and agricultural traders
Merry go rounds	Yes	√	√	√	√	Provides loans to group members
SACCOs (farmers, tea, coffee, rice) (mobile banks)	Yes	√	√	√	√	Provides banking facilities and loans for school fees, farming and business. Also provide agricultural inputs and market farmers' produce
Umoja Women Microfinance	Yes	?	?	?	√	Provides loans to farmers for agricultural related activities (farming, agroprocessing, business)
<b>Projects</b>						
Central Kenya Dry Areas Project (CKDAP)	Yes	√	√	√	√	Promotes the formation of interest groups and provides information on various technologies and farming systems appropriate for dry area projects
Community Environment Facility (EU funded project)	Yes	√	?	?	?	Provides information on poultry, fish farming and tree nursery management
Project - CCSP	No	√	√	√	√	Project funded by the Ministry of Agriculture to support farmers and alleviate poverty. Provides training, information and seed funds
Kenya Agricultural Information Network (KAINet)	No	?	?	?	?	A national network on agricultural information that facilitates the digitisation (e-repository) and sharing of agricultural research information and knowledge
Njaa Marufuku Kenya	Yes	√	√	√	√	Project funded by the Ministry of Agriculture and other partners to support farmers and alleviate poverty. Provides training, information and seed funds. The project is using the farmer group approach to spread new agricultural technologies and improved farming methods
<b>International organisations</b>						
International Centre for Insect Physiology and Ecology	Yes	√	√	√	√	Provides research outputs, training and information on pest management, silk worms
International Livestock Research Institute	Yes	√	√	√	√	Provides research outputs and information on livestock
World Agroforestry Centre (ICRAF)	Yes	?	?	?	√	Provides research outputs and information on agroforestry and multipurpose trees and shrubs and information on sources of seeds e.g. Calliandra
<b>Private sector</b>						
Agro processors	Yes	√	√	√	√	Adds value to produce and expands market e.g. rice, maize, honey, avocados
Agrochemical companies (e.g. Syngenta, Bayer)	Yes	√	√	√	√	Provides agricultural chemicals, pharmaceutical products and information (some like Bayer provide improved tomato varieties seeds to farmers)
Agrovets (large / medium-sized, small)	Yes	√	√	√	√	Provides all agricultural inputs, agrochemicals, animal feeds, tools and information (some)
Animal feeds manufacturers (e.g. Unga Limited)	Yes	√	√	√	√	Provides animal feeds and information
Brokers	Yes / No	√	√	√	√	Purchases horticultural produce e.g. fruits, bananas and other farm produce at farm gate / exploit farmers
Brookside	Yes	√	√	?	?	Purchases farmers milk

Coffee factories / cooperatives	Yes	√	√	√	√	Provides information, advice, inputs (fertilisers and agrochemicals) and market for coffee
Honey Care	Yes	√	?	?	?	Provides information on bee keeping and honey processing, equipment and market for honey
Kenbro chicken brooders		√	√	√	√	Provide day old chicks, feeds, training and information
Kenchic chicken brooders		√	√	√	√	Provides day old chicks, feeds, training and information
Kenya Agricultural commodity Exchange (KACE)	Yes	?	√	?	√	Provides markets and price information
Kenya Cooperative Creameries	Yes	√	√	?	?	Purchases farmers milk
Kenya Nut	Yes	?	?	?	√	Provides market for macadamia
Kenya Planters Cooperative Union	No	?	?	?	√	Supposed to process and market coffee, but does not provide the support required e.g. provision of seedlings, inputs and loans for buying inputs
Local dairies e.g. Kirima dairy	Yes					Collects and sells milk
Maize millers	Yes	√	?	√	√	Add value and provides market for maize
Mastermind Tobacco	Yes	?	?	?	√	Provides information and market for tobacco
Muguku chicken brooders		√	√	√	√	Provides day old chicks, feeds, training and information
Mwea cotton ginnery	Yes	?	?	?	√	Provides information and market for cotton
Ploughing services (tractor / oxen plough)	Yes	√	√	√	√	Provides ploughing services
Private veterinarians / clinicians	Yes	√	√	√	√	Diagnoses and treats animal diseases and offer artificial insemination services
Private weavers	Yes	?	?	?	√	Provides training to farmers on cotton value addition (weaving)
Rice millers	Yes	√	√	√	√	Add value and provides market for rice
Sagana tanneries	Yes	?	?	?	√	Provides market for hides and skins
Seed producing companies (e.g. Regina, Simlaw, Pioneer, Kenya Seed company)	Yes	√	√	√	√	Provides seed needed by farmers
Sun processors	Yes	√	?	?	?	Processes bananas
Traders / brokers	Yes	√	√	√	√	Buys produce from farmers
Transporters	Yes	√	√	√	√	Takes produce to the market
Tropical Farm Management	Yes	?	?	?	√	Provides information, advice and training on improved coffee production and new species, and acts as a bridge between farmers and cooperatives in marketing farmers' produce
<i>Horticultural exporting companies</i>						
Horticultural exporters	Yes	√	√	√	√	Provides training, inputs and market for agricultural inputs
Fineline	Yes	√	√	√	√	Provides inputs and finds international markets for farmers produce
Frigoken	Yes	√	√	√	√	Provides inputs and finds international markets for farmers produce
Hindu Farm exporter	Yes	?	?	√	?	Provides market for French beans
Kenya Horticultural Exporters (KHE)	Yes	√	√	√	√	Provides inputs and finds international markets for farmers produce

Kenya Tea Development Agency (company owned by farmers)	Yes	√	√	x	√	Provides tea extension services to farmers, processes and markets tea
Mwea Rice Growers and Millers (MRGM)	Yes	?	x	√	?	Provides rice milling services
Nicola Farm Company	Yes	?	?	?	√	Provides market for horticultural production (French beans)
Sunripe	Yes	?	?	√	?	Provides information and market for sweet potatoes
WONI company	Yes	?	?	?	√	Provides inputs and finds international markets for farmers produce
<b>Development partners (donors)</b>						
European Union	Yes	√	?	?	?	Provides funding for programmes, information on poultry and fish farming
GTZ	Yes	√	√	√	√	Supported the DGAK and provided information on dairy goat husbandry and breeds
International Fund for Agricultural Development (IFAD)	Yes	?	√	?	√	Provides financial support and information through projects on agriculture, water and health
Netherlands government	Yes	√	√	√	√	Provides financial support, information and training on organisational development (group formation, conflict resolution and management) through projects
Swedish International Development Co-operation Agency (Sida)	Yes	√	√	√	√	Provides financial support to NALEP and collaborates with the Ministry of Agriculture, Ministry of Livestock Development and Ministry of Fisheries in providing demand driven extension services to farmers
USAID	Yes	?	?	√	?	The USAID agronomist provides information on sweet potato production
<b>Small-scale farmers and farmers' groups</b>						
Farmers' groups (self-help groups, cooperatives, associations)	Yes	√	√	√	√	Facilitates access to services and credit
Model / innovative / small-scale farmers (in groups / not in groups, young farmers)	Yes	√	√	√	√	Produces crops and livestock
<b>Markets</b>						
Major markets (Kagio, Makutano, Baricho, Kutus, Kibirigwi, Sagana, Kerugoya, Wan'guru, Kagumo, smaller markets). Others were Nairobi and Mombasa	Yes	√	√	√	√	Provides agricultural, market and price information
<b>Media</b>						
Media (newspapers, TV, radio stations e.g. Inooro, Kenya Broadcasting Corporation)	Yes	√	√	√	√	Provides agricultural and market information
Consumers	Yes	√	√	√	√	Determines what is produced

## Appendix 78: Linkages farmers had with other associations, networks and stakeholders

Network / linkage	Benefits from the linkages
<b>Civil society organisations</b>	
Cooperative society	- Provide agricultural training.
Dairy Goat Association of Kenya	- Market produce (e.g. coffee).
	- Train groups on dairy goat husbandry and provide market linkages.
	- Registration of goat breeds.
Kenya National Federation of Agricultural Producers (KENFAP)	- Train group members.
Kenya Union of Small-scale Tea Owners (KUSSTO)	- Supports the welfare of small-scale tea farmers.
	- Provide banking facilities to members.
Muungano Umbrella group	- Unites 11 groups focusing on tree nurseries.
Projects (Central Kenya Dry Areas Project)	- Provide training to group members.
Groups e.g. Community parliaments	- Plan and work collectively on various agricultural and social issues.
<b>International organisations</b>	
International organisations (e.g. ICIPE)	- Train groups on EurepGap standards.
<b>Development partners</b>	
GTZ	- Train groups on EurepGap standards.
<b>Private sector organisations</b>	
Seed companies e.g. Syngenta	- Establish demonstrations on farmers' farms.
<b>International organisations</b>	
International organisations (e.g. ICIPE)	- Train groups on EurepGap standards.
<b>Government Ministries</b>	
- Ministries of social services, agriculture, livestock, fisheries, water, veterinary department, forestry department	- Support group formation and register groups.
	- Train groups on various agricultural related issues.
	- Provide water for domestic and irrigation.



# Appendix 79: Linkage matrix for Central division, Kirinyaga district

Actor	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26
1. Small scale farmers		x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
2. Women's groups	x		x	x	x	x	x	x	-	-	x	x	x	x	x	x	-	x	x	x	-	-	-	x	x	x
3. Men's groups	x	x		x	x	x	x	x	-	-	x	x	x	x	x	x	-	x	x	x	-	-	-	x	x	x
4. Youth groups	x	x	x		x	x	x	x	-	-	x	x	x	x	x	x	-	x	x	x	-	-	-	x	x	x
5. Mixed groups	x	x	x	x		x	x	x	-	-	x	x	x	x	x	x	-	x	x	x	-	-	-	x	x	x
6. Neighbour	x	x	x	x	x		x	x	?	?	x	x	?	?	-	?	?	?	?	x	-	-	x	x	?	?
7. Agricultural extension	x	x	x	x	x	x		x	x	-	x	x	x	x	x	x	x	x	x	?	-	-	x	x	x	x
8. Livestock extension	x	x	x	x	x	x	x		x	-	x	x	x	x	x	x	x	x	x	?	-	-	x	x	?	?
9. Kenya Tea Development Agency	x	x	x	x	?	x	-		x	-	?	x	-	-	-	-	x	-	-	x	x	-	-	-	-	-
10. Coffee factories	x	x	x	x	?	x	-	x		x	x	-	-	-	-	-	x	-	-	?	-	-	?	-	-	-
11. Seed companies	x	x	x	x	x	x	x	?	-		x	x	-	x	-	-	x	-	-	x	-	-	x	-	-	-
12. Agrochemical companies	x	x	x	x	x	x	x	x	x	x		x	x	x	x	-	-	-	x	x	?	?	x	-	-	-
13. Training institutions (Kamweti)	x	x	x	x	x	x	x	x	x	x	x		x	x	-	-	-	-	-	?	x	x	x	x	x	x
14. Private vets	x	x	x	x	x	x	x	x	-	-	x	x		x	-	-	-	-	-	x	-	?	x	-	-	-
15. Research (KARI, ICIPE)	x	x	x	x	x	x	x	-	-	-	x	x	?		?	-	-	-	x	-	-	-	-	x	-	-
16. Agro processors	x	x	x	x	-	x	x	-	-	-	-	-	-	?		?	-	-	x	-	-	-	-	x	-	-
17. Financial institutions (AFC)	x	x	x	x	?	x	x	-	-	-	-	-	-	-	-	-		-	-	-	-	-	-	-	-	-
18. Kirinyaga Stakeholder Forum	x	-	-	-	-	x	x	x	x	x	-	x	x	x	-	-	-		-	-	-	-	-	-	-	?
19. NGOs (Africa Harvest, Technoserve)	x	x	x	x	?	x	x	-	-	-	-	-	-	-	-	-	-	-		-	-	-	-	-	-	-
20. Dairy Goat Association of Kenya	x	x	x	x	?	x	x	-	-	-	x	x	x	-	x	-	x	-	-		-	-	-	-	x	-
21. Forest Extension	x	x	x	x	x	x	x	x	?	-	x	?	-	?	-	-	-	x	-	-		-	x	x	x	-
22. Tea Research Foundation	x	-	-	-	-	-	-	x	-	-	?	x	-	-	-	-	-	-	-	-	x		-	?	-	-
23. 4-K Club	x	-	-	-	-	x	x	x	-	-	?	x	?	-	-	-	-	-	-	-	x	-		-	x	-
24. Stockists	x	x	x	x	x	x	x	-	?	x	x	x	x	x	x	-	-	-	-	x	x	-	x		-	-
25. Christian Community Service (CCS)	x	x	x	x	?	x	?	-	-	-	-	x	-	-	-	-	-	?	-	-	-	-	-	-	-	

Key X Existing linkage, ? Linkage expected but not expressed, \_ Linkage not expressed and no evidence

1-25 on the horizontal axis is similar to 1-25 on the vertical axis



# Appendix 80: Linkage matrix for Gichugu division, Kirinyaga district

Actor	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32
1. Small scale farmers	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
2. Women's groups	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
3. Men's groups	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
4. Youth groups	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
5. Mixed groups	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
6. Agricultural extension	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
7. Livestock extension	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
8. Kenya Tea Development Agency	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
9. Coffee factories	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
10. Seed companies	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
11. Agrochemical companies	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
12. Farmers training institutions (Kamweti)	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
13. Private veterinary officers	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
14. Research institutions (KARI / JKUAT)	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
15. Agro processors (bananas, honey, tea)	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
16. Credit institutions (SACCOs, microfinance, banks)	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
17. Dairy Goat Association of Kenya (DGAK)	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
18. Forest Department extension	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
19. Stockists	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
20. TIST (international NGO)	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
21. Ministry of Gender, Children and Social Development	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
22. Ministry of Water	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
23. Ministry of Local Government	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
24. DrumNet	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
25. JKUAT	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
26. Horticultural exporters	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
27. Transporters	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
28. Brokers	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
29. TechnoServe	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
30. Africa Harvest	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
31. Kirima Dairy Self Help Group	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
32. Kenya Cooperative Creameries / Brookside	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x

Key X Existing linkage, ? Linkage expected but not expressed, \_ Linkage not expressed and no evidence

1-32 on the horizontal axis is similar to 1-32 on the vertical axis

# Appendix 81: Linkage matrix for Mwea division, Kirinyaga district

Actor	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26
1. Small scale farmers	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
2. Women's groups	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
3. Men's groups	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
4. Youth groups	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
5. Mixed groups	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
6. Agricultural extension	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
7. Livestock extension	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
8. Seed companies	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
9. Agrochemical companies	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
10. Research (KARI, MIAD)	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
11. Agro processors (honey, cotton, rice, cereals)	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
12. Dairy Goat Association of Kenya (DGAK)	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
13. Microfinance (KREP, Equity)	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
14. NIB /MIAD	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
15. Farmers SACCOs	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
16. Input stockists	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
17. Traders	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
18. Horticultural exporters	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
19. Kenya National Draught Animals Technologies (KENI)	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
20. Ministry of Gender, Children and Social Development	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
21. Office of the President	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
22. Ministry of Water	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
23. Ministry of Local Government	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
24. Forest Department	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
25. Christian Community Service (Wanguru)	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
26. IFAD	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X

Key X Existing linkage, ? Linkage expected but not expressed, \_ Linkage not expressed and no evidence

1-26 on the horizontal axis is similar to 1-26 on the vertical axis



## Appendix 82: Linkage matrix for Ndia division, Kirinyaga district

Actor	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
1. Small scale farmers	x	x	x	x	x	x	x	x	x	-	x	-	-	x	x	x	x	x	x	x	x	x	x	x	-	x	x	x	x	x
2. Women's groups	x	x	x	x	x	x	-	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
3. Youth groups	x	x	x	x	x	x	-	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
4. Men's groups	x	x	x	x	x	x	-	x	x	x	x	x	x	x	x	x	-	x	x	x	-	x	x	x	x	x	-	x	-	x
5. Mixed groups	x	x	x	x	x	x	-	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
6. Agricultural extension	x	x	x	x	x	x	x	?	-	x	x	x	x	x	x	x	-	x	x	x	-	x	-	x	x	-	x	-	x	x
7. Livestock extension	x	x	x	x	x	x	x	?	-	x	x	-	x	x	?	x	-	-	x	x	-	x	-	x	-	-	-	-	-	x
8. Seed companies	x	-	-	-	x	?	-	x	x	-	x	-	?	-	-	?	-	x	x	-	-	-	-	-	-	-	x	-	-	-
9. Agrochemical companies	x	x	x	x	x	x	x	x	x	x	x	-	?	x	?	x	-	x	x	x	-	-	-	-	-	x	x	x	-	-
10. Horticultural exporting companies (Top Mark, KHE,)	-	x	x	x	?	-	x	x	x	-	-	-	-	x	-	?	x	-	x	x	x	-	-	-	-	-	-	-	-	x
11. Private veterinary doctors	x	x	x	x	-	x	-	-	-	x	x	-	-	-	-	x	?	-	-	x	x	-	-	-	-	-	-	-	-	-
12. Research institutions	-	x	x	x	x	x	x	x	-	-	-	x	-	-	x	x	x	-	x	-	-	-	x	-	x	-	x	-	-	-
13. NGOs (SACDEP)	-	x	x	x	x	-	-	-	-	-	-	-	x	?	-	x	-	-	-	-	-	-	-	-	-	-	-	-	-	x
14. Financial institutions (SACCOs)	x	x	x	x	x	x	?	?	x	-	-	?	-	x	-	x	x	?	x	x	-	-	x	x	x	-	x	-	x	x
15. Dairy Goat Association of Kenya (DGAK)	x	x	x	x	x	x	-	x	-	x	x	-	-	x	x	-	?	?	-	x	-	-	-	-	-	-	-	-	-	-
16. Educational institutions (JKUAT)	x	x	x	x	x	?	-	?	?	-	x	x	-	-	x	x	-	?	-	-	-	-	-	-	-	-	-	?	-	x
17. Kibirigwi Irrigation Scheme cooperative	x	x	x	x	x	x	?	x	x	?	x	-	x	?	x	x	-	-	x	x	-	-	?	-	-	?	-	-	x	-
18. Religious organisations (Christian Community Service)	x	x	x	x	x	-	-	-	-	-	-	-	-	x	?	-	-	-	-	x	-	-	-	-	x	x	-	-	-	-
19. Horticultural Crops Development Authority	x	x	x	x	x	-	x	x	-	x	-	-	?	-	?	x	-	-	x	x	-	-	?	-	-	-	-	-	-	?
20. Input stockists / agrovets	x	x	x	x	x	x	x	x	x	x	-	-	-	x	x	-	x	x	x	x	x	x	-	x	-	x	-	-	-	x
21. Traders	x	x	x	x	x	x	-	x	x	x	-	-	-	x	-	-	-	-	-	-	x	x	x	-	x	-	-	x	x	x
22. Transporters	x	x	x	x	x	-	-	-	-	-	-	-	-	-	-	-	-	-	-	x	x	x	x	x	-	x	-	-	x	x
23. Draught power	x	x	x	x	x	x	-	-	-	-	x	-	-	-	-	-	x	-	-	-	x	-	x	-	-	-	-	-	-	-
24. Ministry of Local Government	x	x	x	x	x	-	-	-	-	-	-	-	-	x	-	-	-	-	?	x	x	x	x	x	-	-	-	-	-	x
25. Ministry of Gender, Children and Social Development	-	x	x	x	x	x	-	-	-	-	-	-	-	x	-	-	-	-	-	-	-	-	-	x	x	-	-	-	-	-
26. Coffee factories	x	x	x	x	x	-	x	x	-	-	x	-	x	-	-	?	x	-	-	x	-	x	-	-	-	-	x	?	-	-
27. Kenya Bureau of Standards	-	x	x	x	x	-	x	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	?	x	x	-	-
28. Kenya Tea Development Agency	x	x	x	x	-	-	-	x	-	-	x	-	x	-	?	-	-	-	-	-	x	-	-	-	-	-	x	x	-	x
29. Consumers	x	x	x	x	-	-	-	-	-	-	-	-	-	-	-	-	x	-	-	-	x	x	-	-	-	-	-	-	x	x
30. Agro processors	x	x	x	x	x	x	-	-	-	-	x	-	x	x	-	x	-	-	?	x	x	x	-	x	-	-	-	x	x	x

Key X Existing linkage, ? Linkage expected but not expressed, \_ Linkage not expressed and no evidence

1-30 on the horizontal axis is similar to 1-30 on the vertical axis

## **Appendix 83: Assessment of linkages between actors in specific divisions**

### **Central division linkages**

The Central division linkage matrix (see **Appendix 79**) showed that there were interactions between the different categories of farmers with most of the actors except for the Kirinyaga stakeholders' forum; the TRF, which did not relate directly with farmers; and 4-K clubs which were present in some primary schools. Results also showed interactions with KTDA and coffee factories, which linked with individual farmers as opposed to groups (most groups did not produce coffee and tea collectively). Although the matrix shows no linkages with the stakeholder forum, discussions with the Ministry of Agriculture informants indicated that farmers had a representative in the forum. The linkage matrix identified the following key linkages:

- Information and knowledge seeking linkages between farmers and other farmers, farmers' groups, neighbours and other actors.
- Extension and training linkages with Ministry of Agriculture, Ministry of Livestock Development, Forest Department, KTDA, KATC, DGAK, CCS and Africa Harvest, and some seed and agrochemical companies. Some farmers' groups argued that seed and agrochemical companies focused on marketing their produce.
- Service linkages with agrovets (inputs), coffee factories (inputs and processing), seed and agrochemical companies, private veterinarians for animal health services, AFC for agricultural credit.
- Research linkages with KARI and ICIPE (adaptive on-farm research).
- Marketing linkages with coffee factories, KTDA, DGAK, agro-processors and TechnoServe.
- Basic needs linkages between group members and neighbours through social interactions and when sharing information and knowledge.

### **Gichugu division linkages**

Results of the Gichugu division linkage matrix (see **Appendix 80**) corroborated the findings for Central division. However, some groups marketed their coffee collectively through factories or traders and millers that offered higher prices. The linkage matrix highlighted:

- Information and knowledge seeking linkages with most actors.
- Research linkages between farmers and groups with KARI and JKUAT.
- Service linkages with agrovets and SACCOS for inputs, microfinance institutions and banks for loans, Ministry of Local Government for road and market infrastructure. Gichugu had many privately and cooperative owned coffee factories that offered processing services.
- Extension and training linkages with Ministry of Agriculture, Ministry of livestock, Forest Department, KATC, Ministry of Gender, Children and Social Development, KTDA, DGAK, TIST, Africa Harvest, Drumnet and horticultural exporting companies
- Market linkages with KTDA, SACCOS, transporters, agro-processors, horticultural exporters, TechnoServe and farmers' groups. For example the Kirima dairy self help, KCC, Brookside and brokers.
- Basic needs linkages with Ministry of Water and group members attending to each other's needs through social interactions.

### **Mwea division linkages**

The linkage matrix for Mwea division (see **Appendix 81**) differed from those for Central, Gichugu and Ndia divisions because it had different agroecological and climatic conditions (see **section 2.3.1.1**). Most of the actors in Mwea were involved in the growing of cotton, rice, horticultural crops and the keeping of poultry and goats.

Findings from the linkage matrix and the Venn diagrams depicted the following linkages:

- Extension and training linkages with Ministry of Agriculture, Ministry of livestock, Ministry of Gender, Children and Social Development, DGAK and horticultural exporting companies.
- Information and knowledge seeking linkages between farmers and extension, seed companies, agrochemical companies, DGAK, MIAD, horticultural exporters, KENDAT, SACDEP, CCS and Forest Department (see **Appendix 81**). Some of the information providers were illustrated by community members in the Venn diagrams (PRA) of Kathiga sub-location (see **Appendix 84**) and Kombui-ini sub-location in Kangai location (see **Appendix 85**). The Venn diagram of Kathiga sub-location depicted information and knowledge linkages in with the Ministry of Agriculture, MIAD, Ministry of Livestock Development, KARI, Veterinary Department, CCS, Mwea ginnery, Forestry Department, the Community Capacity Support Programme (CCSP), and model farmers (listed in order of their importance. The Venn diagram for Kombui-ini sub-location brought out additional information and knowledge linkages in Mwea division with HCDA, DGAK, Ministry of Water and Irrigation, Ministry of Fisheries, seed and chemical companies, exporting companies and private veterinary services (see **Appendix 85**).
- Research linkages between farmers and groups with KARI and MIAD, (see **Appendix 84** and **Appendix 85**).
- Service linkages with microfinance institutions (KREP, Equity bank), seed and agrochemical companies, agrovets, NIB for irrigation water usage, KENDAT on donkey health services, SACCOs for credit, Office of the President on administrative services and Ministry of Local Government on infrastructural services such as roads and markets.
- Market linkages with agro-processors (cotton, rice, cereals, honey), horticultural exporters, traders, SACCOS and DGAK.
- Basic needs linkages with Ministry of Water and IFAD for water and sanitation.

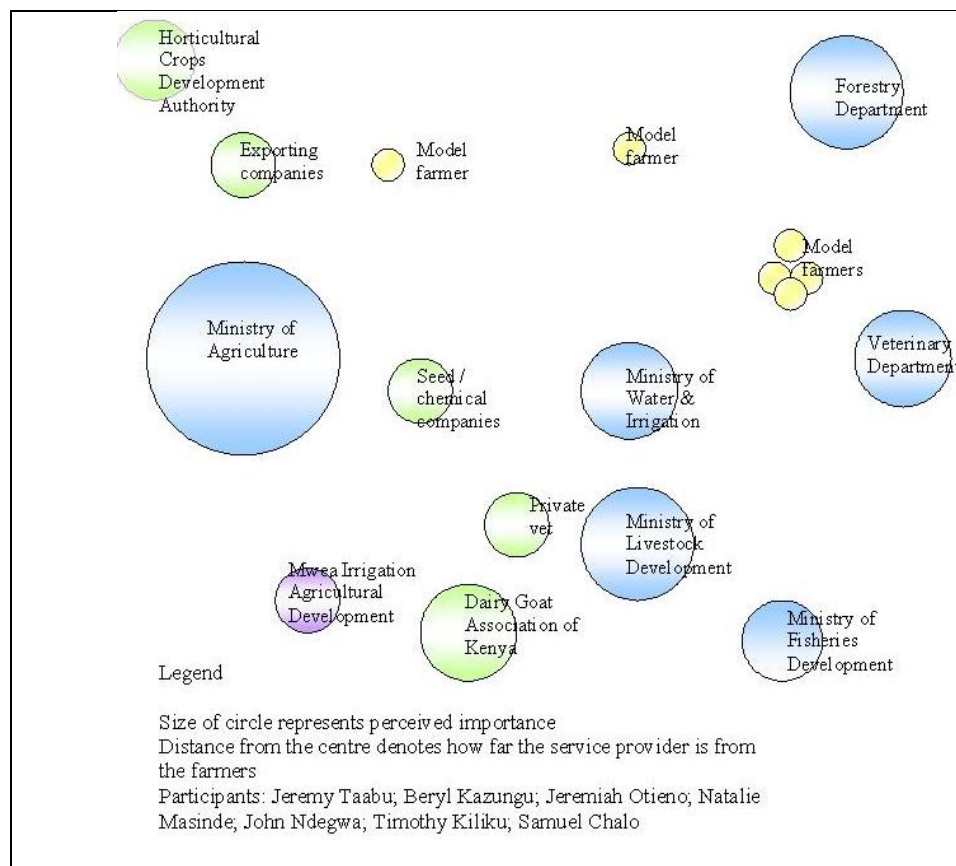
### **Ndia division linkages**

The linkage matrix for Ndia division resembled those for Central and Gichugu divisions because some parts of the division shared similar agroecological conditions but some of the actors on the ground differed (see **Appendix 82**). The main linkages depicted by the linkage matrix included information seeking linkages, service linkages, extension linkages and market linkages.

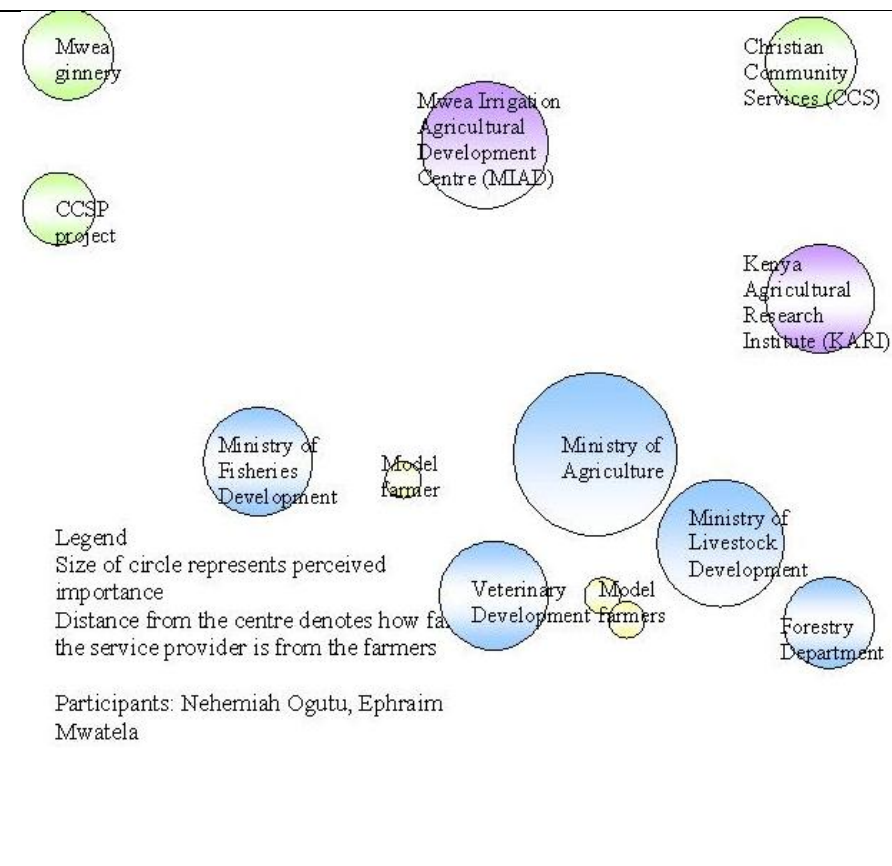
- Extension and training linkages with the Ministry of Agriculture, Ministry of livestock, Ministry of Gender, Children and Social Services, JKUAT, CCS, DGAK, horticultural exporting companies, SACDEP and KIFCO which had their own extension staff to backstop the scheme with support from the Ministry of Agriculture and Livestock Development.

- There were information and knowledge seeking linkages between farmers and groups and key information providers (see **Appendix 82**). Some of the information providers were illustrated graphically in the Venn diagram for Kianjanga and Sagana sub-location, which showed information and knowledge seeking linkages with the Ministry of Education (primary and secondary schools), the Ministry of Agriculture, Ministry of Livestock Development, and horticultural exporting companies, churches and other actors (see **Appendix 86** and **Appendix 87**).
- Market linkages with KIFCO, horticultural exporters (Top Mark and KHE), transporters, HCDA, KTDA, DGAK traders, SACCOS, coffee factories, KPCU, agro-processors and consumers.
- The Ndia linkage matrix and Venn diagrams for Kianjanga and Sagana sub-locations showed input service linkages with JKUAT (TCB), seed and agrochemical companies, agrovets, SACCOs and Kenya Bureau of Standards (KBS) and animal health service linkages with veterinary clinicians. In addition, the Sagana Venn diagram depicted administrative service linkages with the Town Council, and with the chief and sub chief, group formation, management and arbitration services with the Ministry of Gender, Children and Social Services, the local linkages, tanning services with the Sagana tannery, milling services with Centur milling, tobacco processing services with Mastermind Tobacco, horticultural cooling services with horticultural coolers, cereals storage service linkages with NCPB (see **Appendix 87**). **Appendix 56** highlighted infrastructure service linkages with the Ministry of Roads and Public Works.
- There were basic needs service linkages with the Ministry of Health and Ministry of Water for health and water services respectively (see **Appendix 86**).
- **Appendix 86** and **Appendix 87** depicted spiritual needs linkages with churches.

**Appendix 84: Venn diagram of Kathiga sub-location, Kangai location, Mwea division**

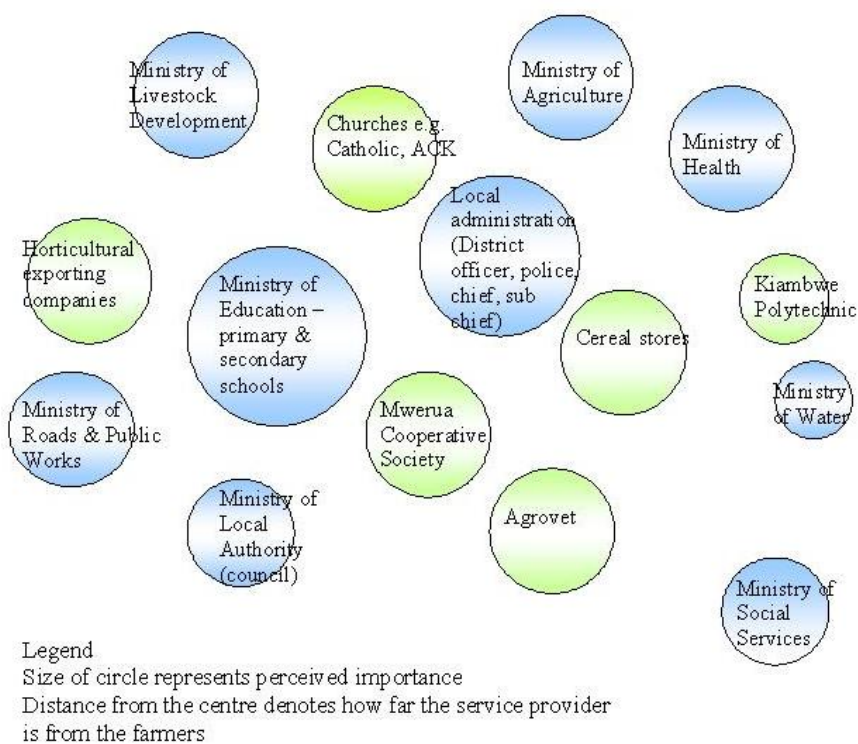


**Appendix 85: Venn diagram of Kombui-ini sub-location, Kangai location, Mwea division**

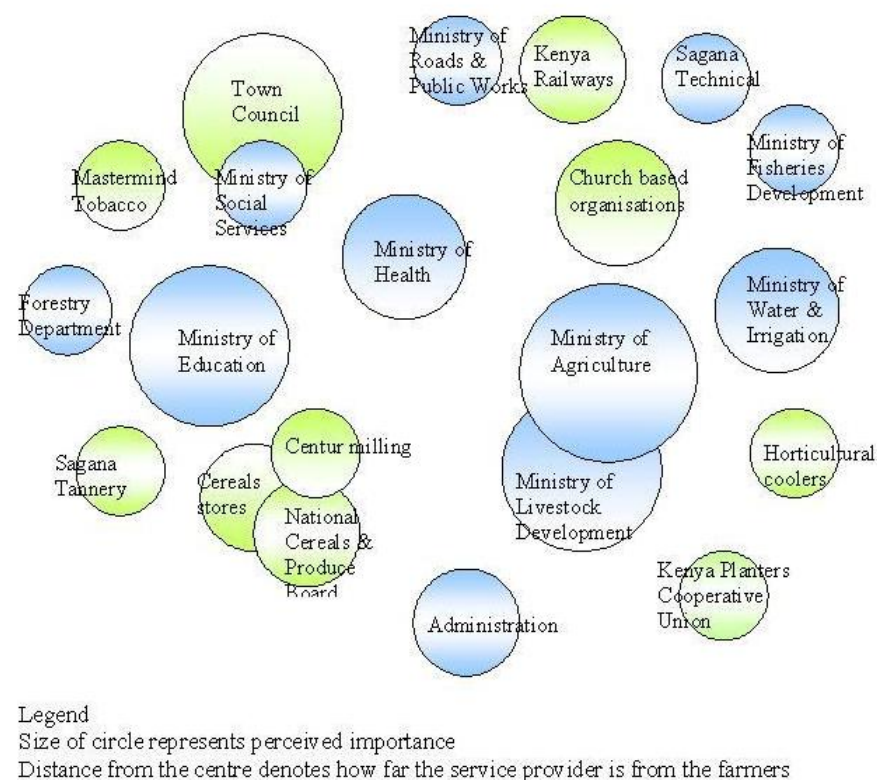




**Appendix 86: Venn diagram of Kianjanga sub-location, Mweru location, Ndia division**

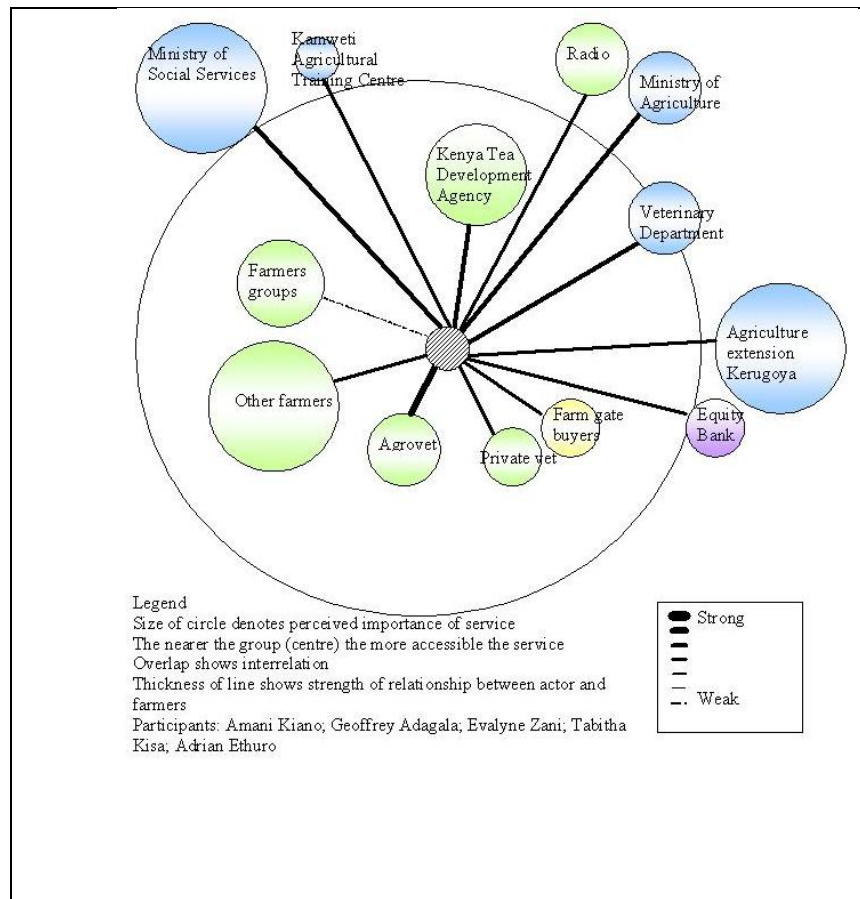


**Appendix 87: Venn diagram of Sagana sub-location, Kariti location, Ndia division**

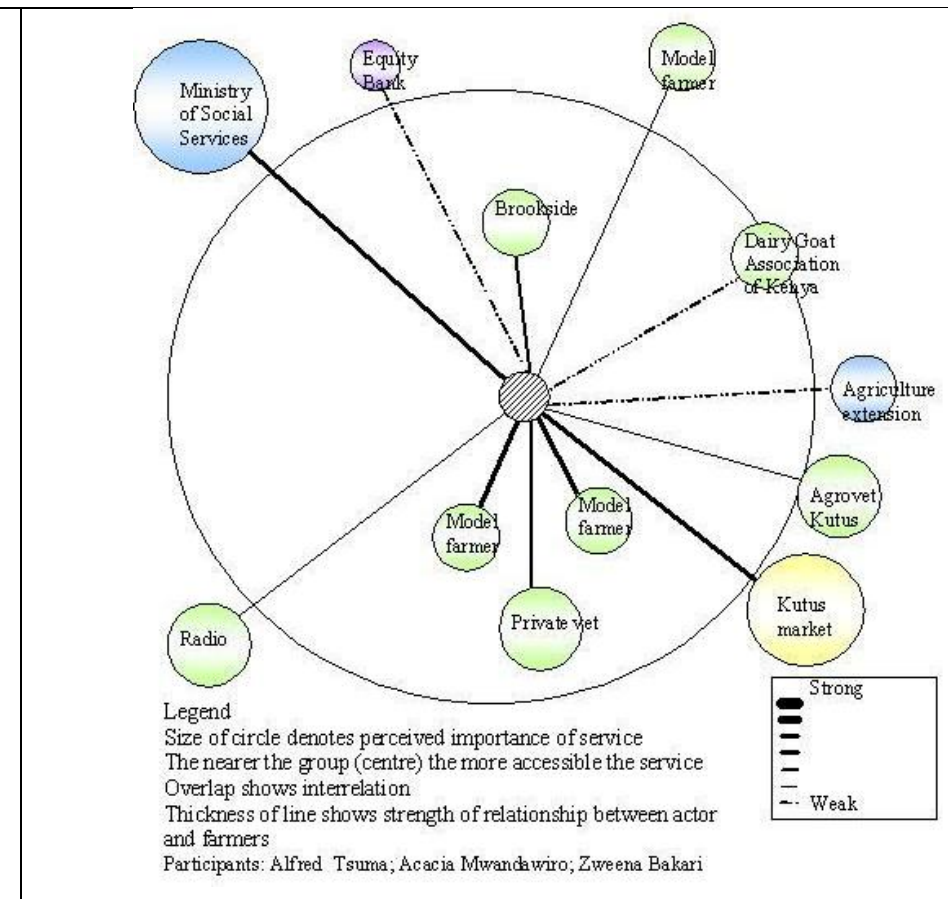




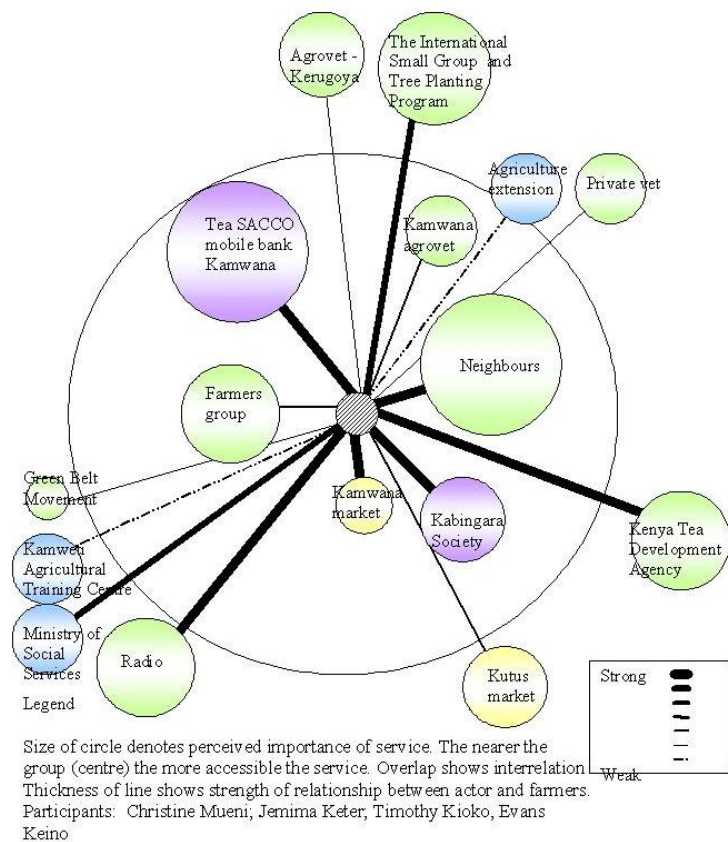
**Appendix 88: Kariko sub-location network diagram, Inoi location, Central division**



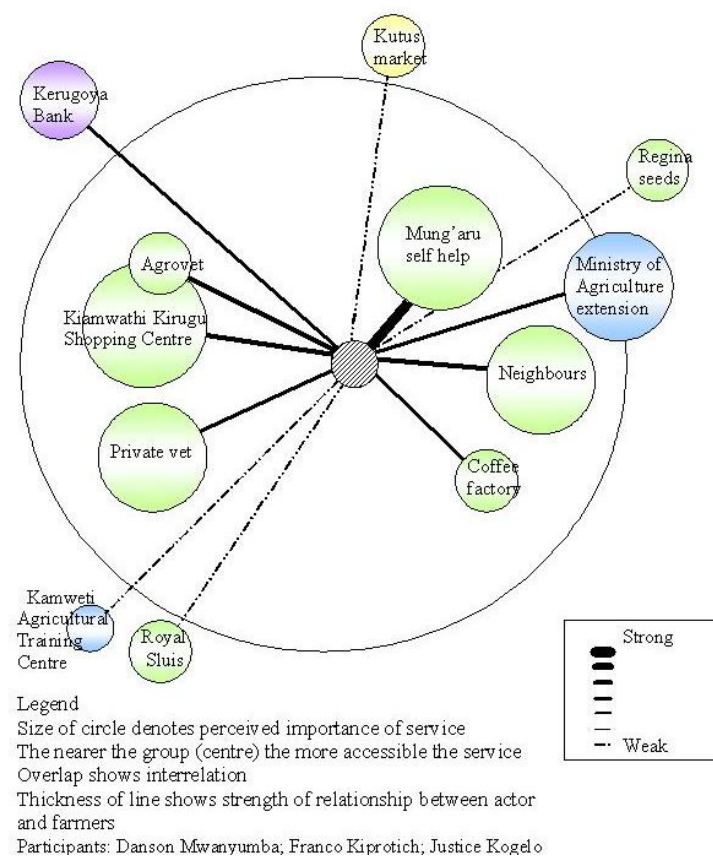
**Appendix 89: Nduine sub-location network diagram, Koroma location, Central division**



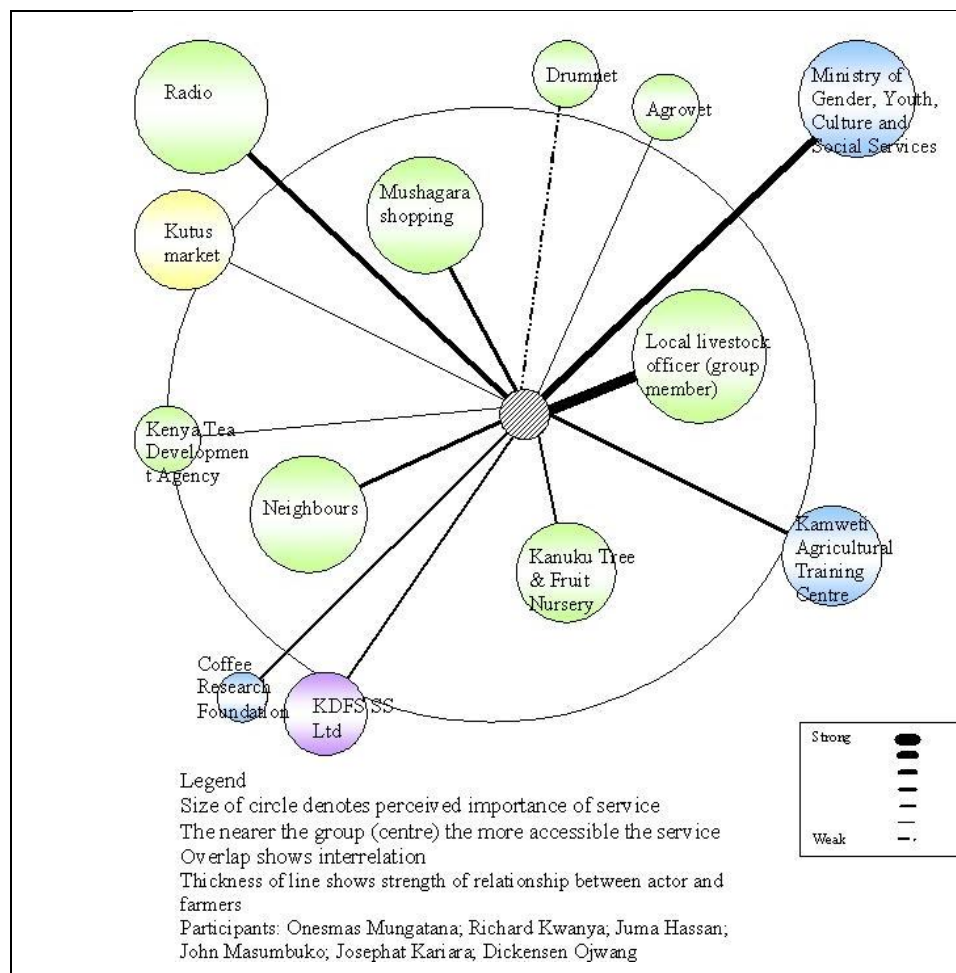
**Appendix 90:** Kabari sub-location network diagram, Mutira location, Gichugu division



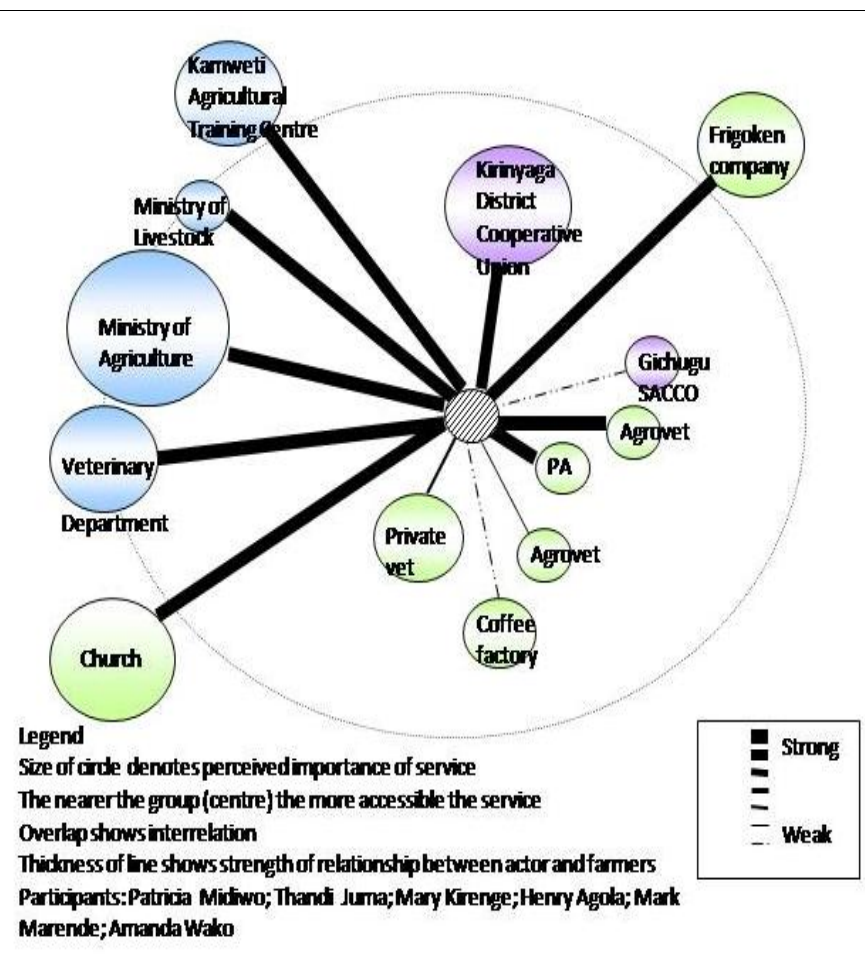
**Appendix 91:** Gatu sub-location network diagram, Baragwi location, Gichugu division



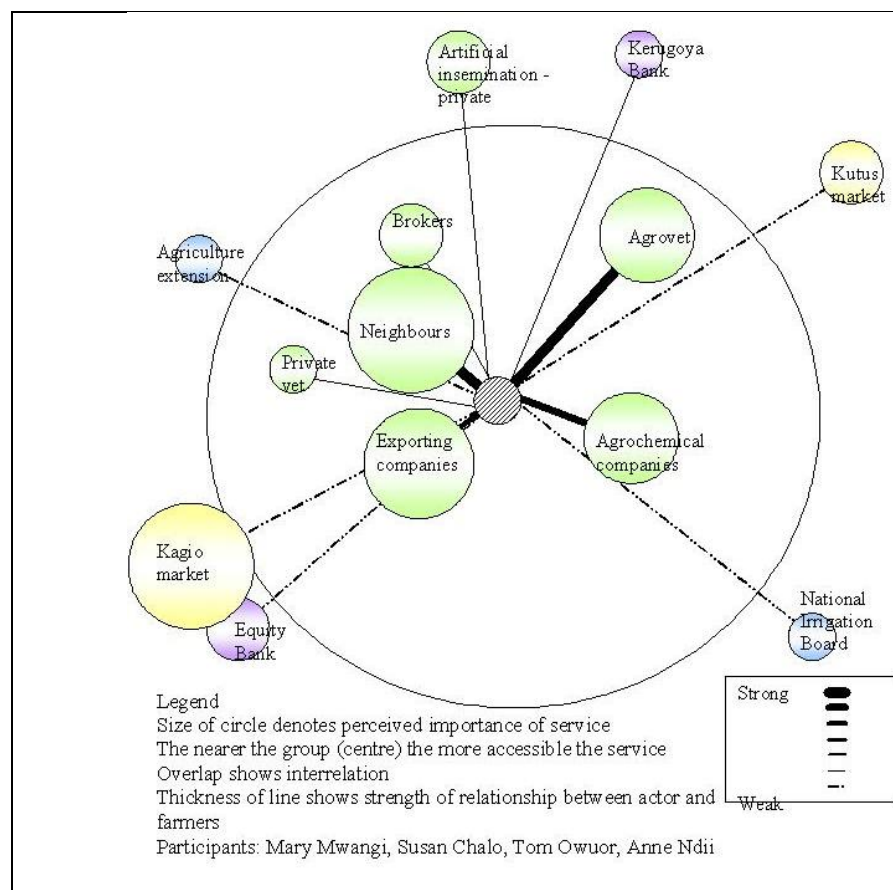
**Appendix 92:** Kariru sub-location network diagram, Karumande location, Gichugu division



**Appendix 93:** Raimu sub-location network diagram, Baragwi location, Gichugu division

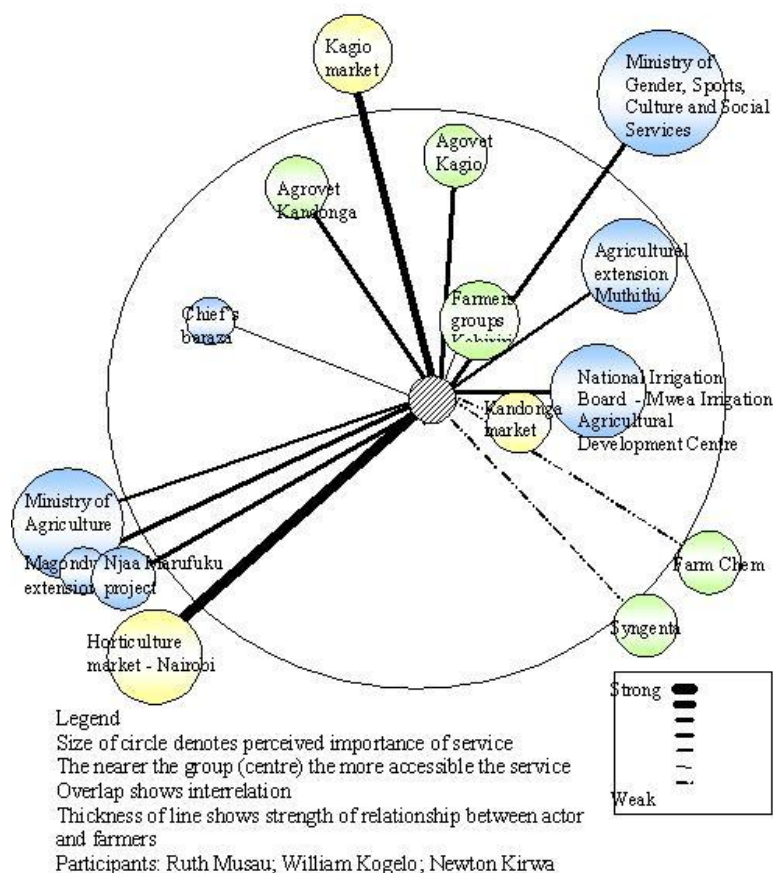


**Appendix 94:** Kombui-ini sub-location network diagram, Kangai location, Mwea division

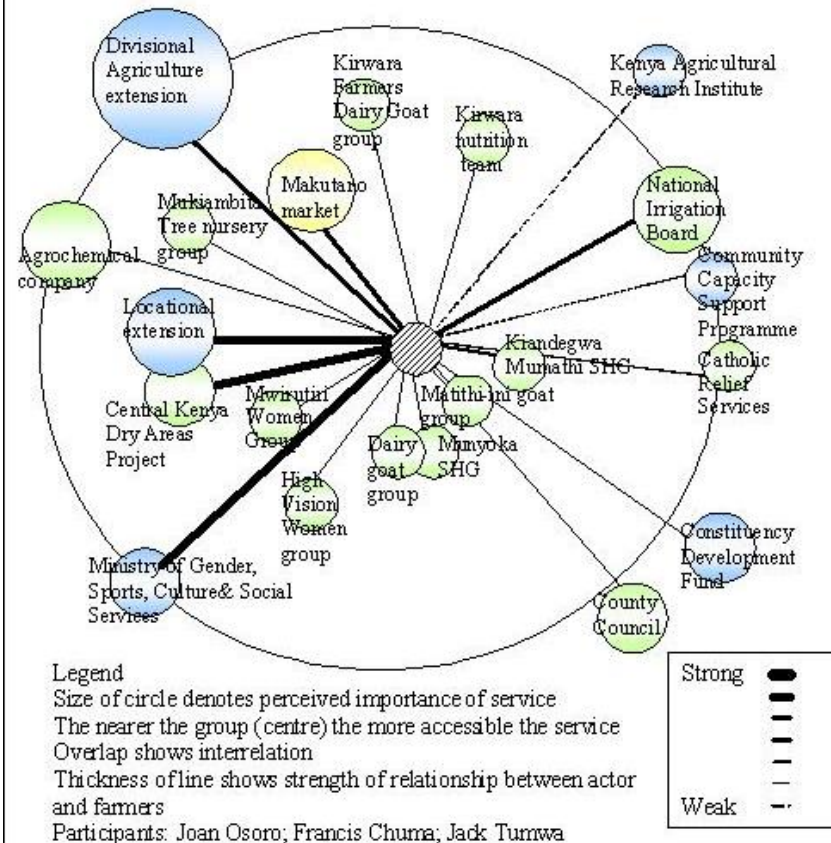




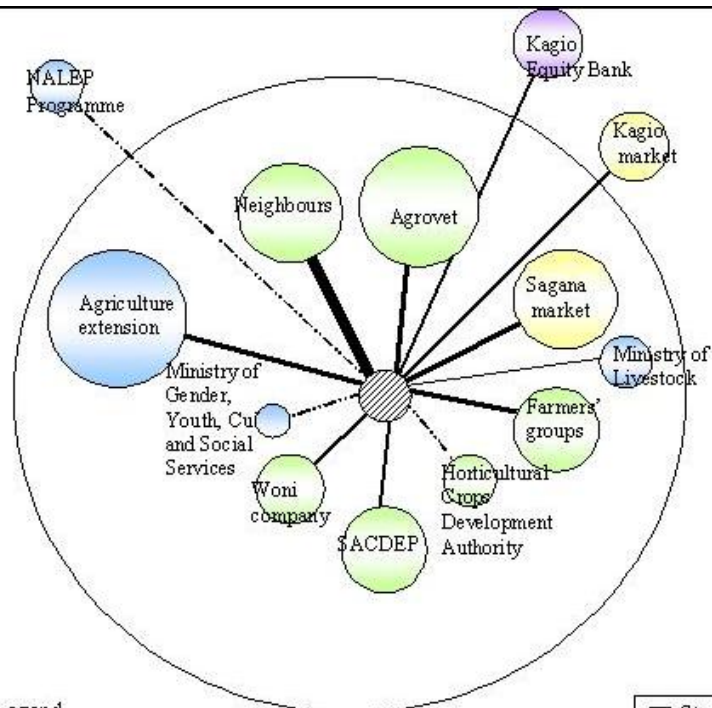
**Appendix 95:** Kinyaga sub-location network diagram, Muthithi location, Mwea division



**Appendix 96:** Kiangdegwa sub-location network diagram, Muthithi location, Mwea division



**Appendix 97:** Sagana sub-location network diagram, Kariti location, Ndia division



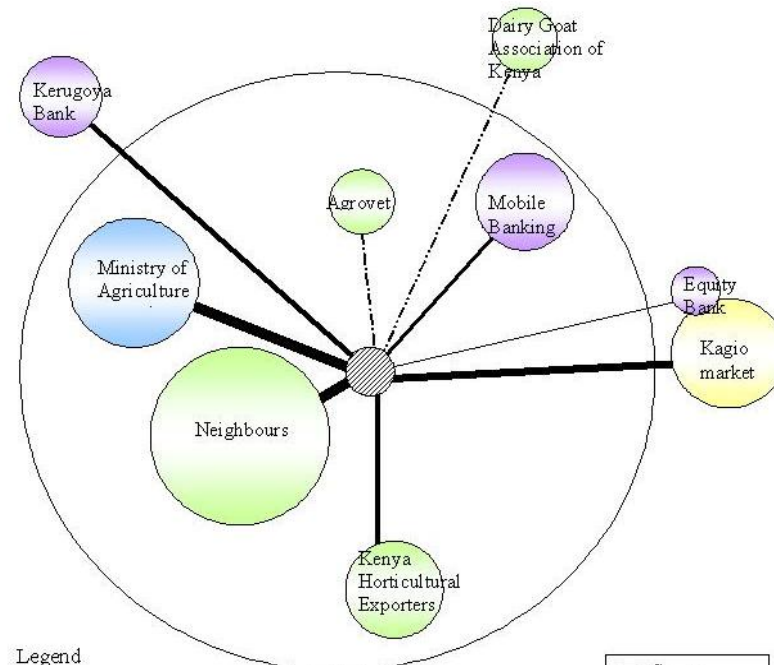
**Legend**

Size of circle denotes perceived importance of service  
The nearer the group (centre) the more accessible the service  
Overlap shows interrelation  
Thickness of line shows strength of relationship between actor and farmers

Participants: Samira Charo, Anastasia Opiyo, Njeri Ndungu



**Appendix 98:** Gitaku sub-location network diagram, Mwerua location, Ndia division



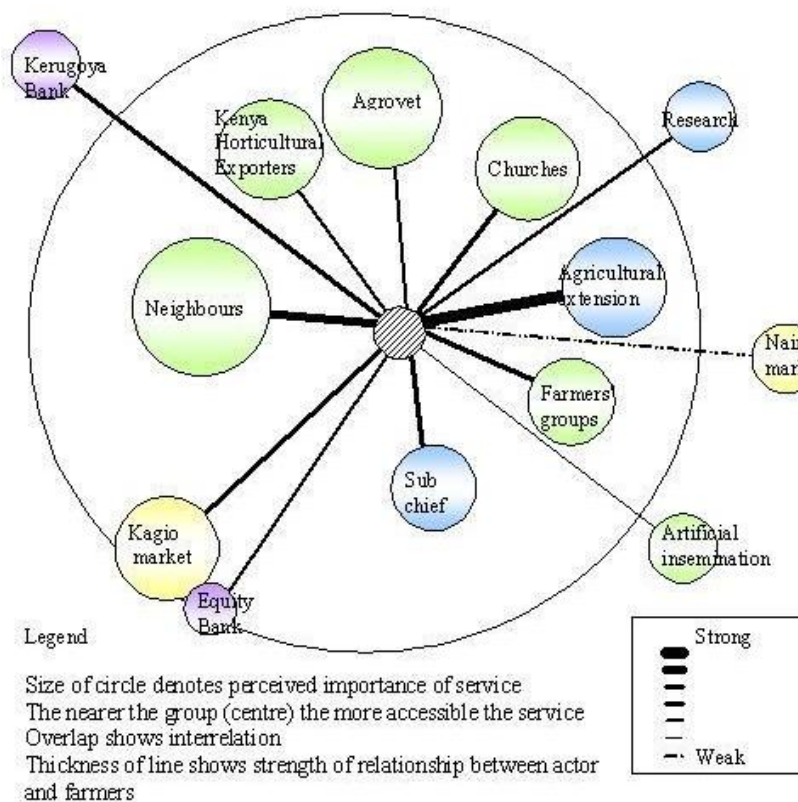
**Legend**

Size of circle denotes perceived importance of service  
The nearer the group (centre) the more accessible the service  
Overlap shows interrelation  
Thickness of line shows strength of relationship between actor and farmers

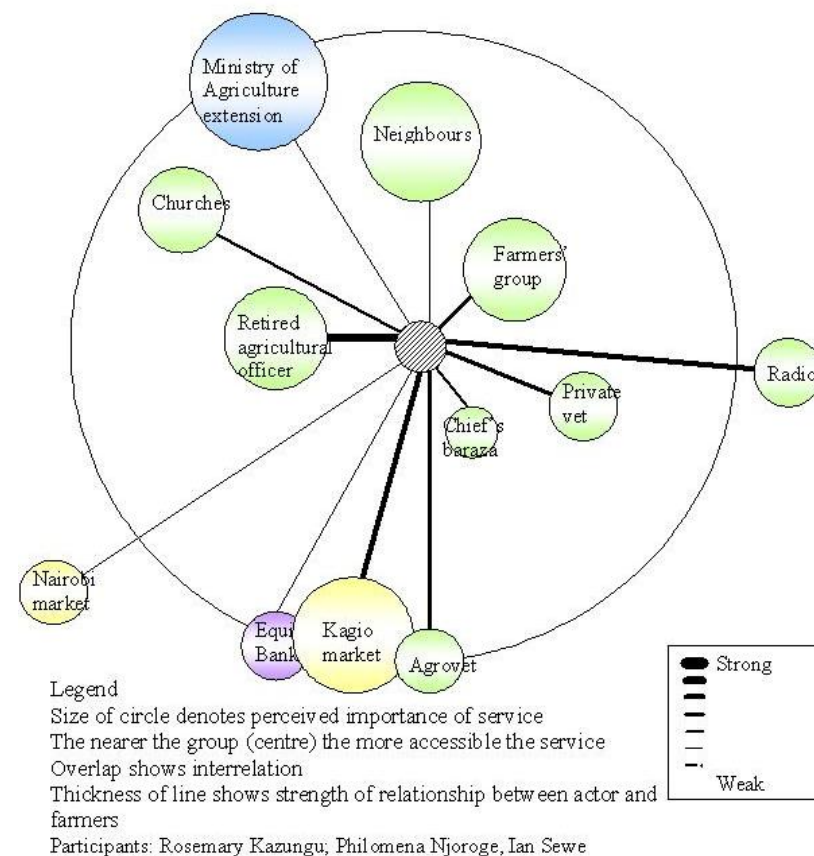
Participants: Samuel Chege, Anastasia Chao, Peter Koech



**Appendix 99:** Kianjanga sub-location network diagram, Mwerua location, Ndia division



**Appendix 100:** Kithumbu sub-location network diagram, Mwerua location, Ndia division



## Appendix 101: Other examples on quality of relationships between farmers and key actors

### Central division

- The network diagram for Ndimi sub-location, Inoi location, Central division (see **Figure 42**) recognised 13 actors who were in regular contact with farmers. The Ndimi sub-location network diagram pointed out the importance of model farmers, farmers' groups and markets. Extension did not emerge as an important actor in Ndimi sub-location, but there were strong information and knowledge seeking linkages (through radio), market linkages (Kagio and Kagumo markets), and service linkages (credit with Equity bank). The Ministry of Gender, Children and Social Services, which provided services in group formation, registration and arbitration), and Equity Bank were perceived to be the most important actors, followed by Kagio market and neighbours and other farmers. Linkages with neighbours (information and knowledge seeking linkages) were considered important because of their experience, proximity and availability. However, their relationship with farmers was not perceived to be strong because some neighbours were not willing to share information or were not sufficiently knowledgeable. This weakness was summarised by one informant, who remarked, "I see my neighbours chickens doing well but when I ask, I do not get the full information. I need technical information."
- In Kariko sub-location in Inoi location, the network diagram established 13 actors who interacted with farmers regularly (see **Appendix 88**). Unlike in Nduine sub-location in the same location (Inoi), where the Ministry of Agriculture extension was not recognised as a key actor, farmers in Kariko sub-location perceived the Ministry of Agriculture extension office in Kerugoya and the Ministry of Gender, Children and Social Services to be the most important actors, followed by neighbours and other farmers, and KTDA. Strong linkages were identified between farmers and extension services at district and division level with the Ministry of Gender, Children and Social Services, KTDA, Veterinary Department, and the agrovet. Fairly strong linkages existed between farmers with neighbours, KATC, media (radio), Equity bank, farm gate traders and the private veterinarian, while linkages with other farmers' groups were not very strong.
- Contrary to the findings in Ngaru sub-location, where agriculture and livestock extension actors were considered to be the most important actors, the network diagram for Nduine sub-location in the same location (Koroma) (see **Appendix 89**) depicted the Ministry of Gender, Children and Social Services as the most important actor, followed by Kutus market. Although agricultural extension was among the twelve actors identified as important, farmers in Ngaru sub-location considered it to be of little importance. There were also linkages with Kutus market, the private veterinarian, model farmers, agrovet in Kutus, DGAK, Equity and the media (radio).

### Gichugu division

- The network diagram for Kabari sub-location, Mutira location, Gichugu division (see **Appendix 90**) identified 16 actors of varying importance having different relationships with farmers. There were strong information and knowledge seeking linkages between farmers and neighbours. Likewise, there were strong credit service linkages with the Tea SACCO mobile bank, which were perceived to be the most important actor. There were



equally strong linkages with TIST (extension and training service linkages in tree planting), KTDA (extension and service linkages), Kabingara society, and media (radio) (information and knowledge seeking linkages), as well as Kamwana market (marketing linkages). The network diagram highlighted weak extension and training linkages between farmers and the Ministry of Agriculture and the KATC, and the importance of neighbours and farmers' groups.

- In Gatu sub-location, Baragwi location in Gichugu division, the network diagram highlighted 12 key actors (see **Appendix 91**) and brought out the importance of farmers' groups and shopping centres. The Gatu network diagram depicted some contact with seed companies (Regina seeds and Royal Sluis) and Kutus market, and linkages with farmers were perceived to be weak. There were strong linkages with Mun'garu self help group (information and knowledge seeking linkages), and fairly strong linkages with neighbours, Kaimwathi Kirugu shopping centre (information and knowledge seeking linkages), coffee factory (agroprocessing service linkages), agrovets (input service linkages) and Kerugoya bank (credit service linkages). Unlike in Kabari sub-location where extension services were perceived to be weak, in Gatu the Ministry of Agriculture was shown to have fairly strong linkages with farmers (extension and training services), but weak linkages with KATC.
- In Kariru sub-location, Karumande location, Gichugu division, the network diagram identified 13 important actors. It was observed that government extension was not recognised as an important actor (see **Appendix 92**). A local livestock extension officer (a group member) was viewed as the most important actor and farmers in the community perceived the information and knowledge seeking linkages with the livestock officer to be strong. Radio and neighbours were perceived to be next in importance but the information and knowledge seeking linkages were stronger between farmers and radio than with neighbours. The Ministry of Gender, Children and Social Services was considered to be next in importance and had fairly strong service linkages with farmers in group mobilisation, group registration and arbitration. The KATC and Kanuku Tree and Fruit nursery followed in order of importance and provided information and knowledge seeking linkages while Mushagara shopping centre provided marketing linkages. There were weak linkages between farmers and the KDFS (credit service linkages), Kutus market (marketing linkages), KTDA (extension and marketing linkages) the agrovet (input service linkages) and CRF (information and knowledge seeking linkages). Linkages between farmers and Drumnet (information and knowledge seeking and marketing linkages) were perceived to be very weak. Informants argued that they did not obtain all the information they needed from the NGO, which had abandoned them after some time.
- In comparison, the network diagram for Raimu sub-location in Baragwi location, Gichugu division identified 13 important actors (see **Appendix 93**). The network diagram depicted the Ministry of Agriculture as the most important actor and there were very strong extension, and information and knowledge seeking linkages with farmers. Next in importance were the KDCU (credit services linkages), Frigoken horticultural exporter (training and extension and marketing linkages), the church (information and knowledge seeking as well as spiritual service linkages), the KATC (extension and training service linkages) was seen to be important in Raimu, and the linkages were all very strong. The Ministry of Livestock, agrovets, public administration were perceived to be less important but had very strong linkages with farmers. The private veterinarian and the

agrovets were not perceived to be very important and linkages with farmers were weak. The services of the veterinarian were seen to be too expensive while the agrovets were not considered to be knowledgeable enough. Contrary to the strong credit service linkages with KDCU, the linkages with Gichugu SACCO were perceived to be weak. Equally weak were information and knowledge seeking services and marketing services between farmers and coffee factories.

### **Mwea division**

- The network diagram for Kombui-ini sub-location, Kangai location, Mwea division (see **Appendix 94**) identified 13 important actors who interacted with farmers in the community regularly. Neighbours and markets were perceived to be the most important actors. The information and knowledge seeking linkages between farmers and neighbours were perceived to be very strong because they were knowledgeable and were easily accessible within the community. Input service linkages with agrovets, KHE (horticultural exporting company) and agrochemical companies were next in importance. While the information and knowledge seeking and marketing linkages with KHE were strong, input service linkages with the agrovets were very<sup>97</sup> strong because the agrovets in the sub-location were perceived to be knowledgeable and provided advice to farmers on appropriate inputs to buy and how to use them. There were fairly strong service and training linkages with agrochemical companies. Marketing linkages with Kutus market, extension and training linkages with the Ministry of Agriculture, credit service linkages with Equity bank, and information and knowledge seeking linkages with the NIB were considered to be of less importance and linkages with farmers were very weak. Likewise, linkages between farmers and Kerugoya bank (credit service linkage), AI and the private veterinarian (animal health services) were weak.
- The network diagram for Kinyaga sub-location in Muthithi location, Mwea division (see **Appendix 95**) depicted the Ministry of Gender, Sports, Culture and Social Development as the most important actor, followed by the Ministry of Agriculture in Mwea and Muthithi, NIB and its research arm – MIAD and the horticultural market in Nairobi. There were strong linkages with the horticultural market in Nairobi and Kagio. The chief's baraza did not emerge as a very important actor but farmers in Kinyaga had some weak information and knowledge seeking linkages, extension linkages and administrative service linkages with the chief's baraza. There were very strong marketing linkages with the horticultural market in Nairobi, strong linkages with Kagio market but weak linkages with Kandonga markets. The agrovets in Kandonga and Kagio had fairly strong linkages with farmers, while the information and knowledge seeking linkages with Farm Chem and Syngenta (input services) were perceived to be very weak.
- In contrast, the network diagram for Kiandegwa sub-location in Muthithi location, Mwea division (see **Appendix 96**) depicted extension services at the division headquarters as the most important actor. The extension and training linkages and information and knowledge seeking linkages with farmers were perceived to be very strong, while linkages with the extension offices in Kerugoya were strong. There were very strong

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<sup>97</sup> The use of very strong or very weak is obtained from field notes made during the PRA exercises and the discussions among the team to emphasise the relative strength of weak or strong but was not among the categories used for drawing the linkage matrices.

linkages with the Ministry of Gender, Sports, Culture and Social Services (service linkages), with the Central Kenya Dry Areas Project (CKDAP) (extension and information and knowledge seeking linkages), and strong linkages with NIB (research, information and knowledge seeking and irrigation service linkages) and Makutano market (marketing linkages). **Appendix 96** highlights the importance of farmers' groups, which provided information and knowledge seeking linkages with their surrounding communities. However, linkages between the farmers' groups and the communities around them were perceived to be weak because they did not reach very many farmers.

- By comparison, linkages with the NIB, which were considered to be weak in Kombui-ini sub-location (see **Appendix 94**), were viewed to be of medium strength in Kiandegwa sub-location. There were strong linkages with CKDAP in Kiandegwa and with the Ministry of Agriculture, but research linkages with KARI were weak. In Kinyaga sub-location, there were strong linkages with Ministry of Gender, Children and Social Services (service linkages in group formation, registration and arbitration). The Kinyaga sub-location network diagram (see **Appendix 95**) highlighted the importance of the chief's baraza and the Njaa Marufuku Kenya project (information and knowledge seeking, and basic needs linkages), the County Council (service and administrative linkages), Makutano market (marketing linkages) and the CRS (extension and training, information and knowledge seeking and basic needs linkages) in the AKIS of Kinyaga sub-location.

#### **Ndia division**

- The network diagram for Sagana sub-location, Kariti location, Ndia division (see **Appendix 97**) identified 13 actors who were in regular contact with farmers. Extension followed by neighbours were perceived to be the most important actors in the community but farmers had stronger information and knowledge seeking linkages with neighbours than with extension (extension and training and information and knowledge seeking linkages). Linkages between farmers and neighbours were considered to be important because of their experience, proximity and availability. The quality of relationships with extension, agrovets and Sagana market were equally strong and farmers interacted with them frequently because they were easily accessible and were located within the sub-location. Extension was perceived to be very important because of their good technical knowledge base, while agrovets were considered to be important because they provided all the inputs the farmers required. Farmers rated the Sagana market as important because it provided an outlet for their produce, which solved their marketing problems. Other linkages identified included (arranged in order of strength of relationship as depicted by thickness of line): farmers' groups, who were within the sub-location and met regularly (in group meetings). The groups owned a rich collective knowledge base, which was shared freely with group members and some non-members. Farmers' groups had linkages with SACDEP, which provided training service linkages in value addition of bananas. Woni Company (horticultural exporting company) and the HCDA information and knowledge seeking and marketing linkages were rated as having equal importance, but the linkages with HCDA were weak. NALEP was accorded equal importance, but the linkages with NALEP were perceived to be weak. There were also linkages with the Ministry of Gender, Youth, Culture and Social Services, which provided service linkages in group mobilisation, group formation, registration and arbitration but the linkage was weak.

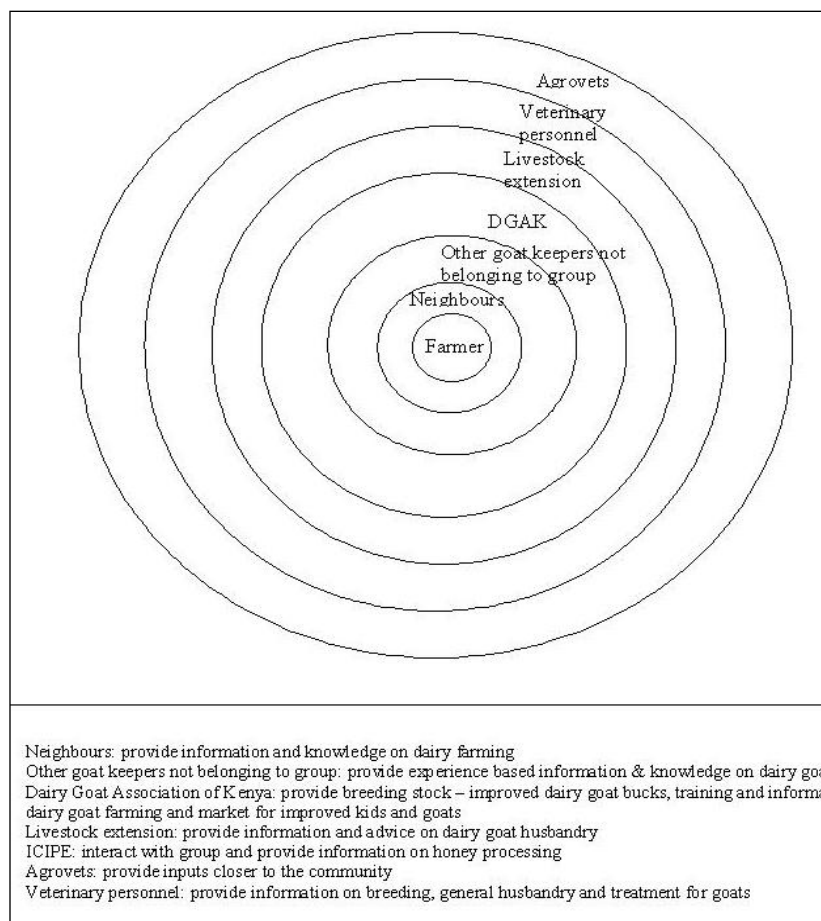
- The network diagram for Gitaku sub-location, Mwerua location, Ndia division (see **Appendix 98**) distinguished 10 actors who were in regular contact with farmers. Neighbours were perceived to be the most important actor and the quality of their relationship with farmers was perceived to be very strong because they were easily available and in regular contact with farmers. Neighbours were also considered to be knowledgeable and explained things they had learned and experienced to other farmers through demonstration on their own farms. However, some members of the PRA team argued that some neighbours were not willing to share information or were jealous, while others purposely provided misleading or inaccurate information. Extension was second in importance because they were not available when required but were perceived to be knowledgeable and provided good and comprehensive technical information and knowledge. Another important actor was the Kagio market, which provided strong marketing linkages with farmers.
- Other interactions included (arranged in order of strength of relationships as depicted by thickness of line): horticultural exporting companies provided training, inputs and marketing linkages to farmers though some farmers considered them to be exploitative. The PRA team members explained that farmers were reduced to price takers, as the companies developed the contracts without any reference to them or negotiations. The informants also pointed out that some exporters breached the contracts at the expense of farmers, by failing to collect produce, or lowering prices without prior notice or discussion. One farmer explained that even if the vehicle<sup>98</sup> broke down on the road when transporting produce to Nairobi, the loss was passed on to the farmers. However, it was noted that some farmers also breached the contract by failing to deliver produce to exporters and selling to intermediaries who offered higher prices.
- Kerugoya bank, SACCO mobile bank and Equity bank provided credit service linkages. Farmers in Ndia division perceived the linkages between agrovet and farmers to be weak because some of the agrovet did not have sufficient training, experience and knowledge in agriculture and the products they stocked. As a result, they could not explain or answer farmers' questions. Linkages with the DGAK representative who was located within the sub-location were rated weak because contact with farmers was irregular. In addition, the cost for service was perceived to be expensive. As a result, farmers only called the DGAK official when it was considered very necessary. The DGAK also provided a market for dairy goat kids and breeding stock. Linkages with the DGAK officers in the Nyeri office were perceived to be equally weak because of transport or communication costs, long distance to Nyeri and non availability of the officers.
- The Kianjanga sub-location network diagram (see **Appendix 99**) depicted neighbours as the most important actor, followed by the agrovet, agricultural extension, horticultural exporters, Kagio market and churches. There were, however, stronger linkages with extension than with neighbours. The network diagram for Kianjanga also brought out the role of the sub chief, who provided information and knowledge seeking linkages and administrative service linkages. There was some interaction between farmers and research but the linkages were weak and with Kerugoya Bank, Equity Bank (credit service linkages), AI service (breeding service linkages), but linkages with the Nairobi market (marketing linkages) were weak.

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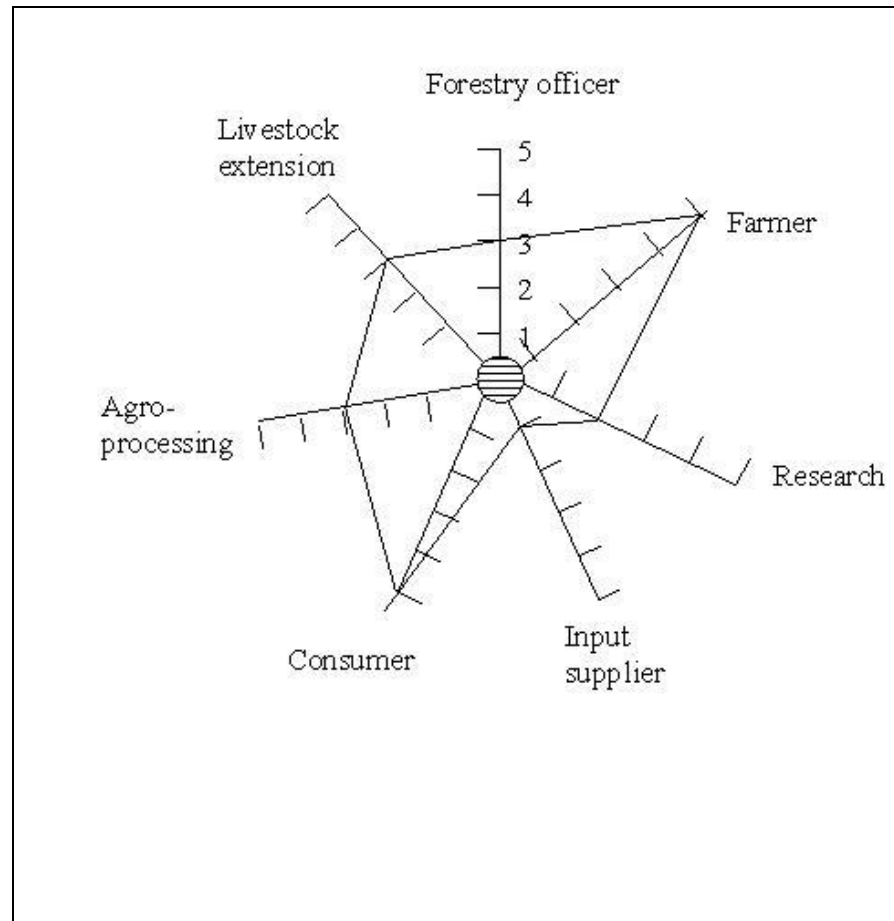
<sup>98</sup> Transportation is provided by the exporting company that collects, weighs and transports the produce to Nairobi for grading, packaging and exporting.

- In contrast, in Kithumbu sub-location network diagram depicted the Ministry of Agriculture extension as the most important actor, followed by neighbours, a retired agricultural officer, farmers' groups, and Kagio market (see **Appendix 100**). However, linkages with the Ministry of Agriculture extension were weak (extension and training and information and knowledge seeking linkages). Farmers were in more regular contact with a retired officer in the community, with whom they shared a fairly strong relationship (extension and information and knowledge seeking linkages), followed by Kagio market (marketing linkages), radio (information and knowledge seeking linkages), farmers' groups (information and knowledge sharing linkages) and the agrovet (input service linkages). There were linkages with churches (information and knowledge seeking and spiritual linkages), with the private veterinarian (animal health service linkages), the chief's baraza (information and knowledge seeking and administrative service linkages), Equity bank (credit service linkages) and the Nairobi market (marketing linkages) though the linkages were not strong.

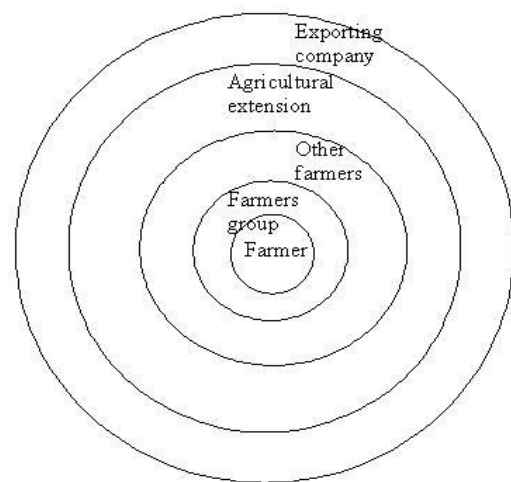
**Appendix 102:** Communication network of Kanduga dairy goat self help group, Koroma location, Karia sub-location



**Appendix 103:** Prime mover septagram of Kanduga dairy goat self help group, Koroma location, Karia sub-location

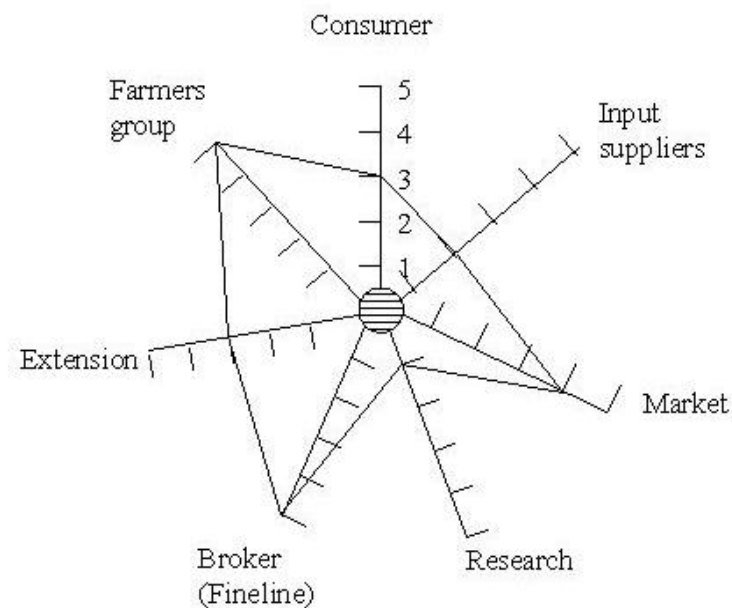


**Appendix 104:** Communication network of Maarifa self help group in Rung'eto sub-location, Ngariama location, Gichugu division

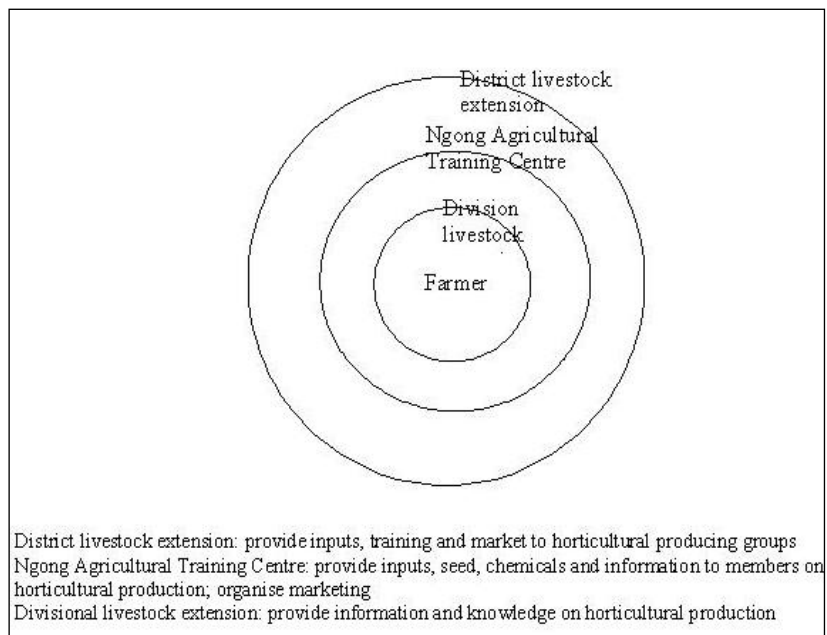


Horticultural exporters: provide inputs, training and market to horticultural producing groups  
 Other farmers: provide inputs closer to the community and information on seeds, pest and disease control  
 Agricultural extension: provide advice and information, training, policy guidelines, arbitration,  
 Farmers group: provide inputs, seed, chemicals and information to members on horticultural production; organise marketing

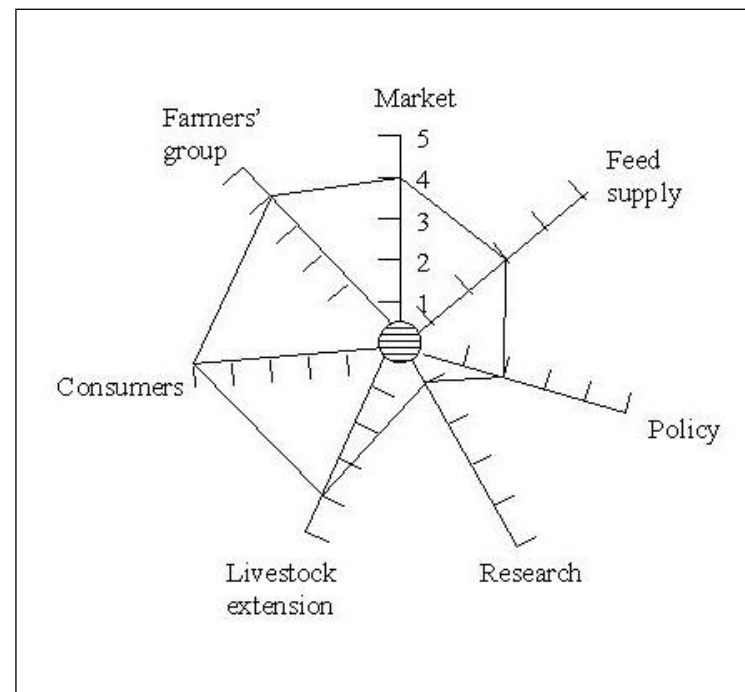
**Appendix 105:** Prime mover septagram of Maarifa self help group in Rung'eto sub-location, Ngariama location, Gichugu division



**Appendix 106:** Communication network of Kiambatha rabbit group in Rung'eto sub-location, Ngariama location, Gichugu division

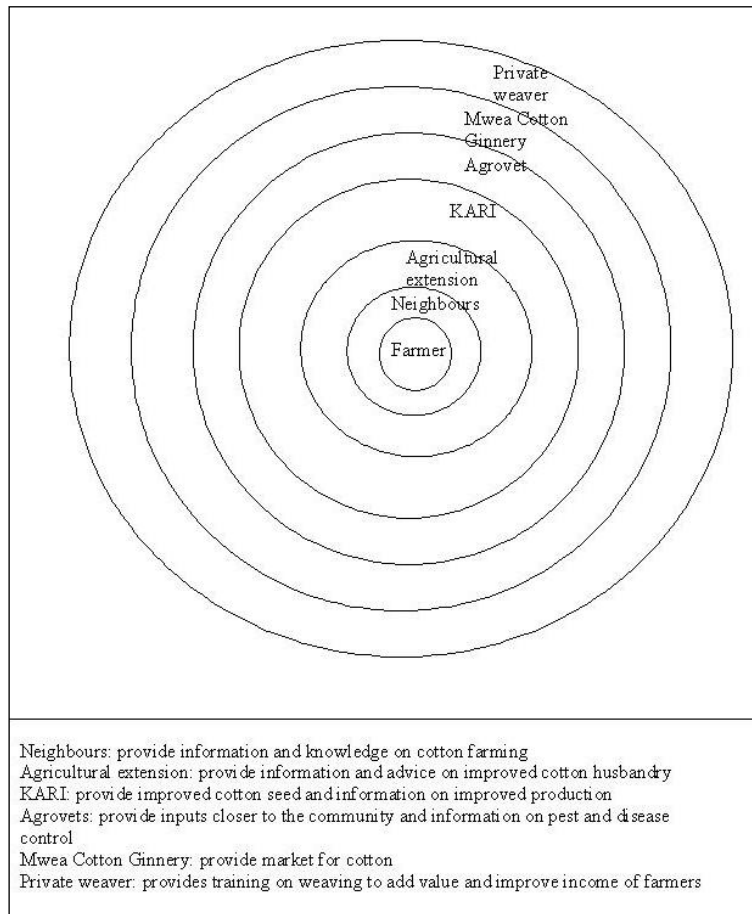


**Appendix 107:** Prime mover septagram of Kiambatha rabbit group in Rung'eto sub-location, Ngariama location, Gichugu division

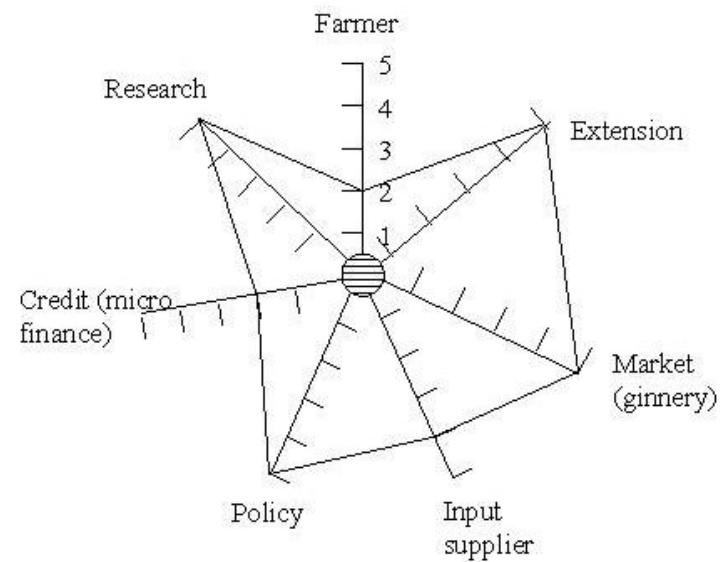




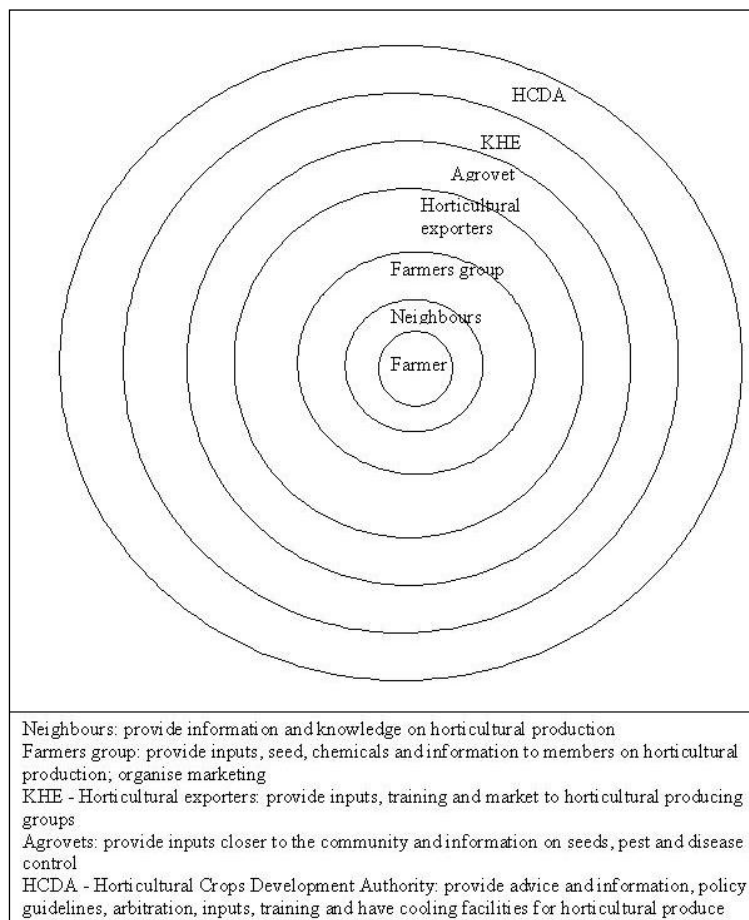
**Appendix 108:** Communication network of Wendani cotton growers self help group in Riagicheru sub-location, Murinduko location in Mwea division



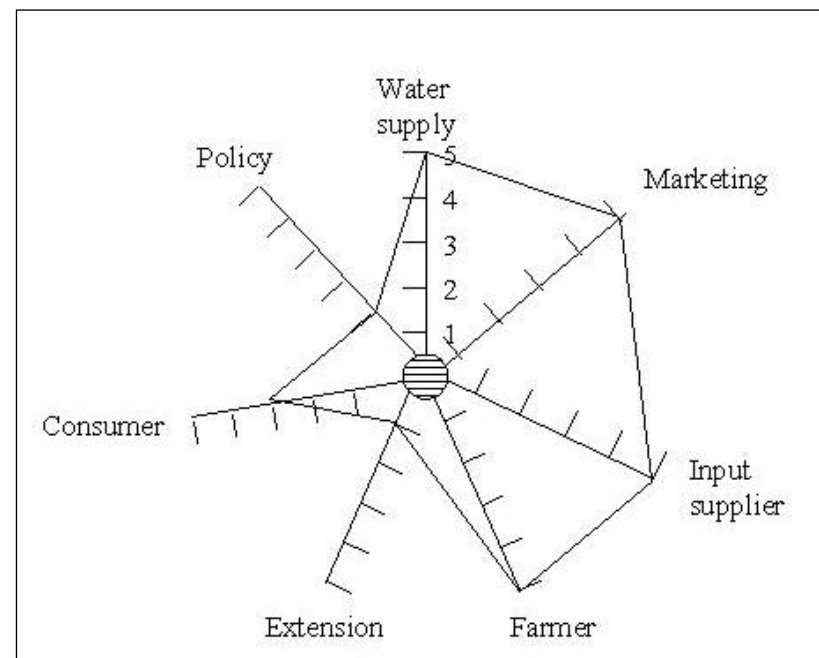
**Appendix 109:** Prime mover septagram of Wendani cotton growers self help group in Riagicheru sub-location, Murinduko location in Mwea division



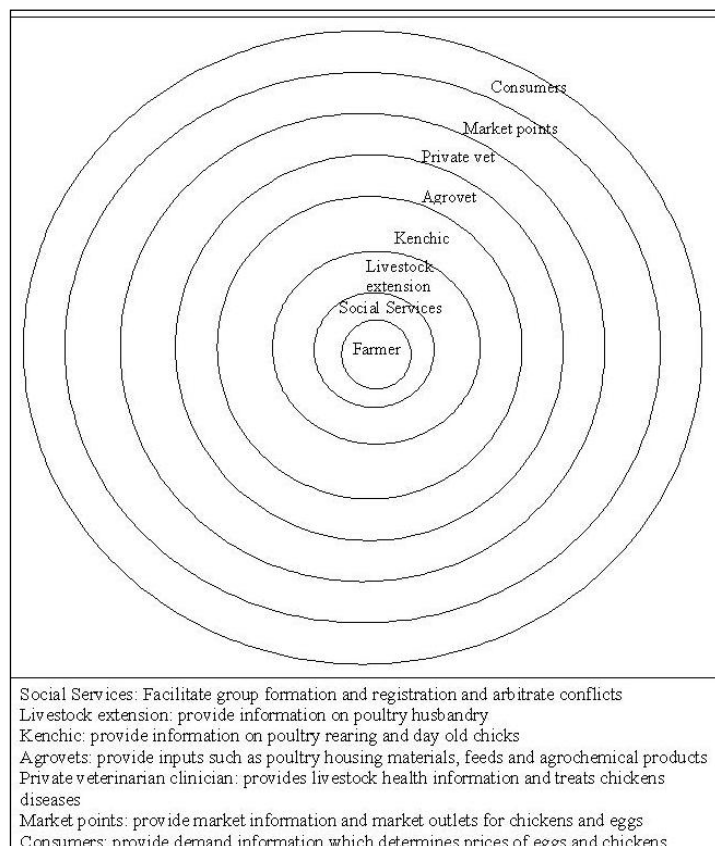
**Appendix 110:** Communication network of Gathiga horticultural self help group in Gathiga sub-location, Kangai location, Mwea division



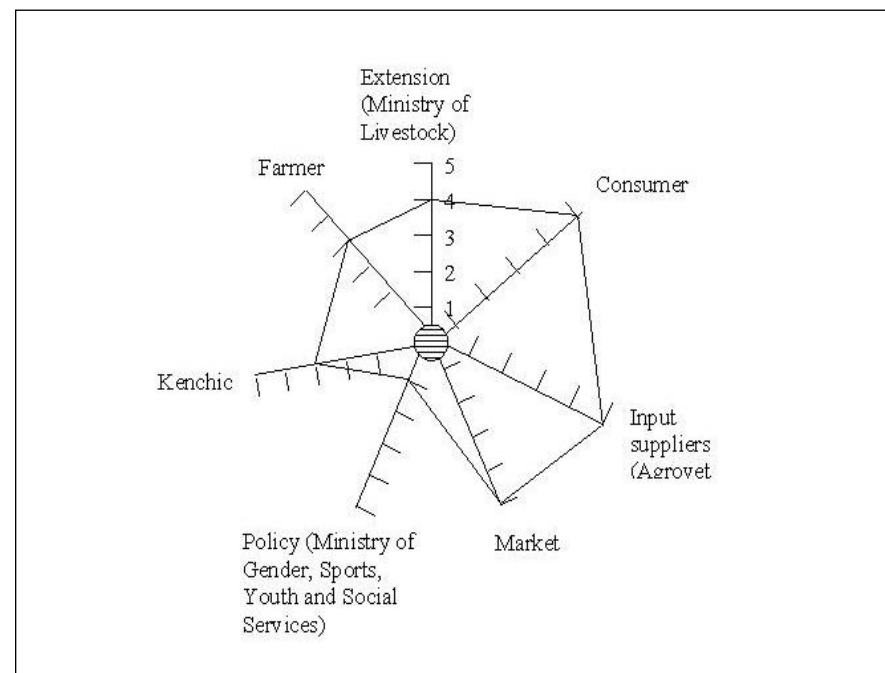
**Appendix 111:** Prime mover septagram of Gathiga horticultural self help group in Gathiga sub-location, Kangai location, Mwea division



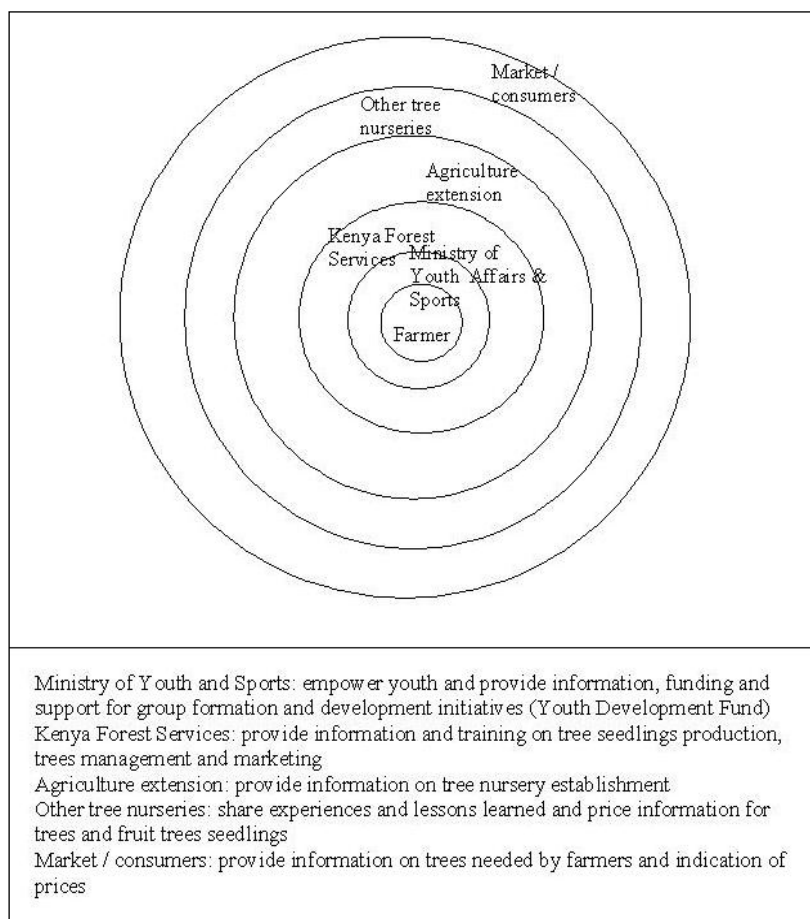
**Appendix 112:** Communication network of Magita poultry group in Sagana sub-location, Kariti location in Ndia division



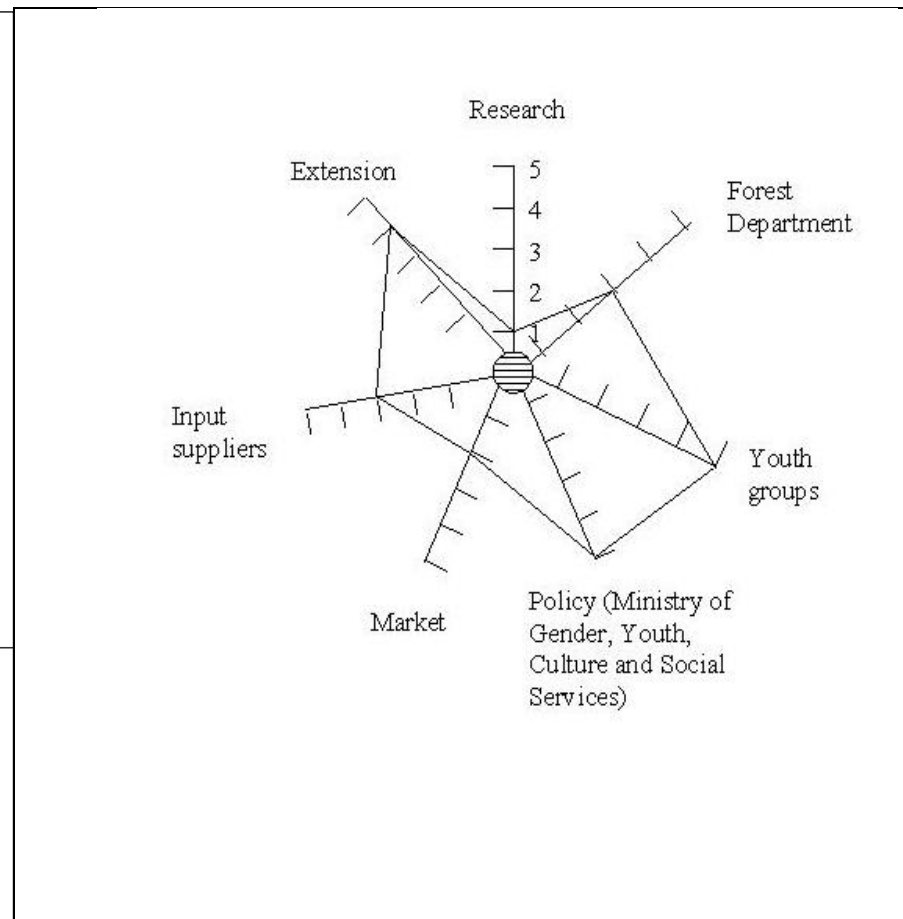
**Appendix 113:** Prime mover septagram of Magita poultry group in Sagana sub-location, Kariti location in Ndia division



**Appendix 114: Communication network of Miti-ini tree seedling youth group in Kianjan'ga sub-location, Mwerua location in Ndia division**



**Appendix 115: Prime mover septagram of Miti-ini tree seedling youth group in Kianjan'ga sub-location, Mwerua location in Ndia division**



## **Appendix 116: Other examples on other enterprises produced and the importance of actors and the influence of lead actors**

### **Gichugu division - importance of actors and the influence of lead actors**

The enterprises selected to show the importance of key actors and the influence they exerted in Gichugu division were horticulture and rabbits.

#### *Horticultural enterprises*

- i) The communication network of Maarifa self help group in Rung'eto sub-location, Ngariama location, Gichugu division portrayed farmers' groups as the most important actor in the growing of horticultural enterprises (see **Appendix 104**). The groups provided information on production and marketing and facilitated access to inputs such as seed and agrochemicals. Neighbours came second and provided information and knowledge on cotton husbandry and they were readily available within the vicinity. Some neighbours were very knowledgeable, and had many years of experience in cotton production and marketing. These farmers shared their knowledge assets and experiences with other farmers. Agricultural extension was third in importance and provided advice and information on horticultural production, while Fineline (an exporting company) was ranked fourth and provided information and support to farmers' groups on good horticultural practices and a market for horticultural produce.
- ii) The Prime mover septagram of Maarifa self help group showed farmers' groups and Fineline (an exporting company) to be the leaders that influenced the horticultural sub-industry most in the day to day activities of horticultural farmers (score of 5) (see **Appendix 105**). Markets came second (4), followed by extension and consumers (3). Input suppliers provided less influence (2) while research exerted the least influence (1).

#### *Rabbit enterprise*

- i) The communication network of Kiambatha rabbit group in Kabari sub-location, Ngariama location in Gichugu division (see **Appendix 106**) ranked extension (divisional level) as the most important and influential actor in rabbit farming, followed by the Ngong Agricultural Training Centre (external actor), who provided training and information on rabbit farming. The district livestock extension office that provided information on rabbit farming was ranked third in importance.
- ii) The prime mover septagram for Kiambatha rabbit self help group in Kabari sub-location portrayed consumers as the most influential actors (score of 5) in the day-to-day activities of rabbit farmers. There was high demand for rabbit meat, which was nutritious and affordable (see **Appendix 107**). Livestock extension, farmers' groups and the market also exerted strong leadership in the rabbit sub-sector and provided information on rabbit husbandry. There was a ready market (local and export) for rabbit meat and by-products (4). Feed suppliers exerted less influence (3), while policy makers were not perceived to be very influential (2). Research provided the least influence or leadership in the rabbit enterprise sub-sector (1).

### **Mwea division - importance of actors and the influence of lead actors**

Cotton and horticultural crops were selected to demonstrate the importance of key actors in Mwea division and the influence they exerted in the day to day activities of farmers.

### *Cotton enterprise*

- i) The communication network for Wendani cotton growers self help group in Riagicheru sub-location, Murinduko location in Mwea division (see **Appendix 108**) ranked neighbours as the most important actor in relation to cotton production. Some neighbours had many years of experience with the crop and provided information and knowledge on cotton husbandry and were readily available. Agricultural extension officers were second in importance and provided extension services and information and advice on cotton husbandry. KARI was third in importance because they provided an improved cotton seed variety that was drought resistant, high yielding, and information on cotton production. Agrovets were ranked fourth, and provided agricultural inputs required for cotton production, and information on pests and diseases. The Mwea cotton ginnery was fifth in importance because they provided a market for the produce. A private weaver was ranked sixth, and provided value addition services through training in weaving to improve income. It was noted that although there was a private company (Juanco) that was paid to provide spraying services to farmers, following which the costs were recovered during sale to the ginnery, the farmers did not mention Juanco among the important actors because they were dissatisfied with the service provided.
- ii) The Prime mover septagram for Wendani cotton self help group in Riagicheru sub-location portrayed research, extension, markets and policy as the prime movers who included activities in the operational activities of farmers in the cotton sub-sector (5), followed by input suppliers (4). Farmers and credit institutions were perceived to be less influential (2) (see **Appendix 109**).

### *Horticultural crops*

- i) The communication network of Gathiga horticultural self help group in Gathiga sub-location, Kangai location, Mwea division (see **Appendix 110**) highlighted neighbours as the most important actor because of their proximity and the fact that they shared information and knowledge they had learned on horticultural crops production, followed by farmers' groups who provided inputs (seed, agrochemicals), information, and facilitated marketing of members' produce. Horticultural exporters were rated third in importance because they provided a market and some provided extension services, training and inputs. However, some exporters were considered to be exploitative as they did not involve farmers in the drafting of contracts or involve them in any major decisions. Some offered very low prices for produce delivered. Farmers complained about high levels of down grading and in some cases rejection of produce on grounds of sub-standard quality, yet the group members graded the produce at the marketing shed before it was collected, weighed and transported to Nairobi. Some farmers remarked that even when the canter broke down in transit while transporting the farm produce and the goods withered, the loss was often borne by farmers. Besides, payment for goods delivered was received late. Some farmers cited examples of unscrupulous exporting companies that had disappeared without paying for produce collected. Agrovets came fourth and provided inputs and information on pest and disease control, followed by e) KHE, which provided information on GLOBALGAP standards. Number six was the HCDA, which provided advice and information, policy guidelines, arbitration, inputs and cooling facilities. However, farmers considered the capacity, coverage and activities of HCDA to be limited.
- ii) The prime mover septagram of Gathiga horticultural self help group in Gathiga sub-location brought out farmers, input suppliers, marketing and water supply as the prime movers in the horticultural sub-sector

(5) (see **Appendix 111**). Policy and extension had very little influence (1), while consumers commanded more influence (3).

### **Ndia division - importance of actors and the influence of lead actors**

Poultry and tree seedling enterprises were selected to exemplify the importance of key actors in Ndia division and the leadership roles they played or the influence they exerted in guiding the two sub-sectors.

#### *Poultry enterprise*

- i) In Ndia division, the communication network of Magita poultry group in Sagana sub-location, Kariti location (see **Appendix 112**) demonstrated the roles and importance of government, private sector and market actors. The Ministry of Gender, Children and Social Services was perceived to be the most important actor because they facilitated group formation and registration, linked groups to agricultural actors and arbitrated conflicts in groups. The Ministry of Livestock Development was second in importance because they provided farmers with information on poultry husbandry. Kenchick was accorded third position because of the role they played in providing day-old chicks and information on poultry production. Next were agrovets, who provided inputs such as housing materials, feeds and agrochemicals. Private veterinarians were ranked number five because they provided livestock health services and information on poultry diseases and their management. Market points took sixth position and provided market information and outlets for chickens and eggs. Consumers were ranked seventh because they determined the quantities to produce and prices of eggs and poultry meat.
- ii) The prime mover septagram of Magita poultry group in Sagana sub-location, Kariti location, Ndia division (see **Appendix 113**) depicted markets, input suppliers and consumers to be the prime movers that influenced the poultry sub-industry (5). The Ministry of Livestock came next in terms of influencing the poultry sub-industry and provided information on poultry husbandry (4), followed by Kenchic, which provided day old chicks and then farmers. In contrast, although the Ministry of Gender, Children and Social Services was depicted as the most important actor in the communication network diagram of Magita poultry group (see **Appendix 112**), it did not have a leadership role or much influence in the poultry sub-industry (3).

#### *Tree seedlings*

- i) The communication network for Miti-ini seedling youth group in Kianjan'ga sub-location, Mwerua location in Ndia division (see **Appendix 114**), ranked the Ministry of Gender, Youth, Culture and Social Services as number one because they facilitated the empowerment of the youth and provided information, funding for initiatives and support for group formation and development (YDF). Second was the Kenya Forest Services, which provided information and training on tree seedling production, management and marketing. The Ministry of Agriculture was ranked third, and provided information on tree nursery establishment, followed by other tree nurseries who shared their experiences and lessons learned, as well as price information. The market / consumers were ranked fifth, and provided a market for the tree seedlings.
- ii) The prime mover septagram of Miti-ini tree seedling youth group in Kianjan'ga sub-location, Mwerua location, Ndia division (see **Appendix 115**) portrayed policy and youth groups to be the most influential in shaping the tree seedling sub-industry (5). The Ministry of Gender, Youth, Culture and Social

Services, input suppliers and consumers were perceived to be the prime movers in the tree seedling sub-sector (5). The Ministry provided financial support through the YDF to support projects, while the youth were keen to engage in income generating activities. The Ministry of Agriculture also influenced the day-to-day activities of the youth group by providing information and knowledge on tree nursery establishment and management (4). The Forest Department provided advice and information to the youth and input suppliers (3) but did not provide much leadership role. Markets provided information and market intelligence on demand and prices and an outlet for tree seedlings. On the other hand, research exerted the least influence in the operational activities of farmers in the tree nursery sub-sector.

#### **Appendix 117: Time line of agricultural activities in Kinyaga sub-location, Muthithi location, Mwea division**

1957	Land demarcation
1958	Allocation of land based on clan size (some had 50 acres) Each person allocated at least 3 acres Before demarcation, people lived in Ndia Before demarcation, no trees in the area - trees planted by prisoners Crops - black and yellow gram for food and sale Maize and beans bought Large numbers of indigenous cattle, sheep, goats, donkeys Traders bought produce from farm Extension services available but no diseases, no sprays Kandongu was a detention camp / prison
1970s	Artificial insemination introduced Few exotic livestock breeds Veterinary services available and medicines available at Kerugoya Indigenous medicines used to treat livestock diseases
1985	French beans and tomatoes introduced
1990s	Crops grown - butternuts, cucumber, French beans, maize, onions, tomatoes, pepper, rice Sold at Kagio market and Nairobi Brokers know market prices - no stable price Information sought from agrovets, other group members, neighbours, extension officers, pharmaceutical / agrochemical companies,
	<i>Changes</i> Declining soil fertility Extensive use of fertilisers / less use of farmyard manure Farmers leasing agricultural land Average land size ½ to one acre One cow per family, few goats and chickens



	Water problem - from wells and bore holes
2000s	<p>Agricultural programmes aired on radio but prefer broadcast to be evenings</p> <p>Jua kali rice production</p> <p>National Irrigation Board provides farmers with information on rice growing</p> <p>Some farmers' groups originated from the clan groupings that opened up membership to outsiders</p> <p>Groups give loans, merry go round money and advice on farming</p> <p>Jua kali rice produced by groups that lease land and farm together</p> <p>Other crops grown by groups - French beans, tomatoes</p> <p>Diseases and pests - army worms, poultry diseases</p>

### **Appendix 118: Reasons why farmers preferred radio, cellular phones and television**

#### **Radio**

The use of voice (listening) makes them appropriate for learning / accessing information agricultural.

They are convenient and are available in most homes.

They reach the farmer where he is.

They are fast and reliable.

They are affordable.

They are easy to operate.

They are interactive and one can ask questions by phoning or writing.

They update us with quality information by bringing current information.

They provide expert advice.

They provide information on new technologies.

They use vernacular language that most farmers understand.

Has a wide reach and message is received by many people.

They disseminate information on a wide range of topics.

They share experiences by role models which motivate farmers.

There are very few extension officers so radio is the starting place for farmers.

Radio captures people's attention.

#### **Cellular phone**

The use of voice makes them appropriate for accessing information and knowledge.

They are accessible and readily available in most homes.

They speed up delivery of information.

They help to access agricultural related information from experts in case of a problem.

They are efficient for accessing price and market information.

They allow for direct and two-way / interactive communication.

They are easy to operate.

They are fast and efficient.

They save time and money.

#### **Television**

The use of voice and image facilitates learning and understanding.

They help to us to access some agricultural related information.

## Appendix 119: Impact of ICTs on farming activities

### Increased knowledge and awareness

Information reaches us very fast and on a daily basis.

We have been exposed to new ideas and improved farming methods.

We have acquired new skills / knowledge on farming.

We learned about the uses of avocados (value addition) from listening to a radio programme.

We first heard of rabbitry from a radio programme then we demanded training and decided to adopt rabbit farming

We heard about a drug "Velbazen" on the radio and used it to control worms in goats and cows.

We learned about new varieties and obtained contacts of experts.

### Increased adoption of technologies

We first heard of bee keeping on the radio then the group leaders looked for people to train us.

Information from the radio on cross breeding linked us to improved breeds.

We learned about the improved dairy goat from the radio and later adopted it

### Improved farming, production, profits

We have adopted new farming methods.

ICTs have changed the group from subsistence to commercial farming.

We have acquired skills on improved farming techniques.

ICTs have led to improved crop production and high profits

### Accessed markets

Our group has obtained linkages to markets through use of ICTs.

People interested in buying seedlings call us directly using cell phones

We have penetrated new markets

### Improved communication

ICTs have made communication easier - we called several groups to a central place and shared information.

ICTs have facilitated us to demand for service when we need it and we get interventions much quicker.

We have saved on communication costs.

## Appendix 120: Feelings of small-scale farmers in connection with use of ICTs

### Feelings of happiness and satisfaction

*Appropriateness and effectiveness*

ICTs are good, effective and appropriate for our needs.

Information reaches me appropriately.

Radio is a good medium for sharing information.

ICTs have helped me improve production.

ICTs are easy to use.

*Relevance*

Topics covered are relevant and are presented by knowledgeable people.

ICTs have been an eye opener.

*Efficiency*

ICTs have saved time and speed up delivery of information.

ICTs reach many people in the farming area.

ICTs disseminate agricultural information and knowledge regularly.

### Feelings of happiness and satisfaction

ICTs can enhance knowledge but can also mislead.

They sometimes give information that is not relevant to my needs.

With radio and video, one cannot ask questions.

ICTs should be made more affordable.

Information conveyed through cellular phone is short.

Radio is not so good because I can hear but I cannot see.

Radio and TV are not adequate for accessing agricultural information and knowledge.

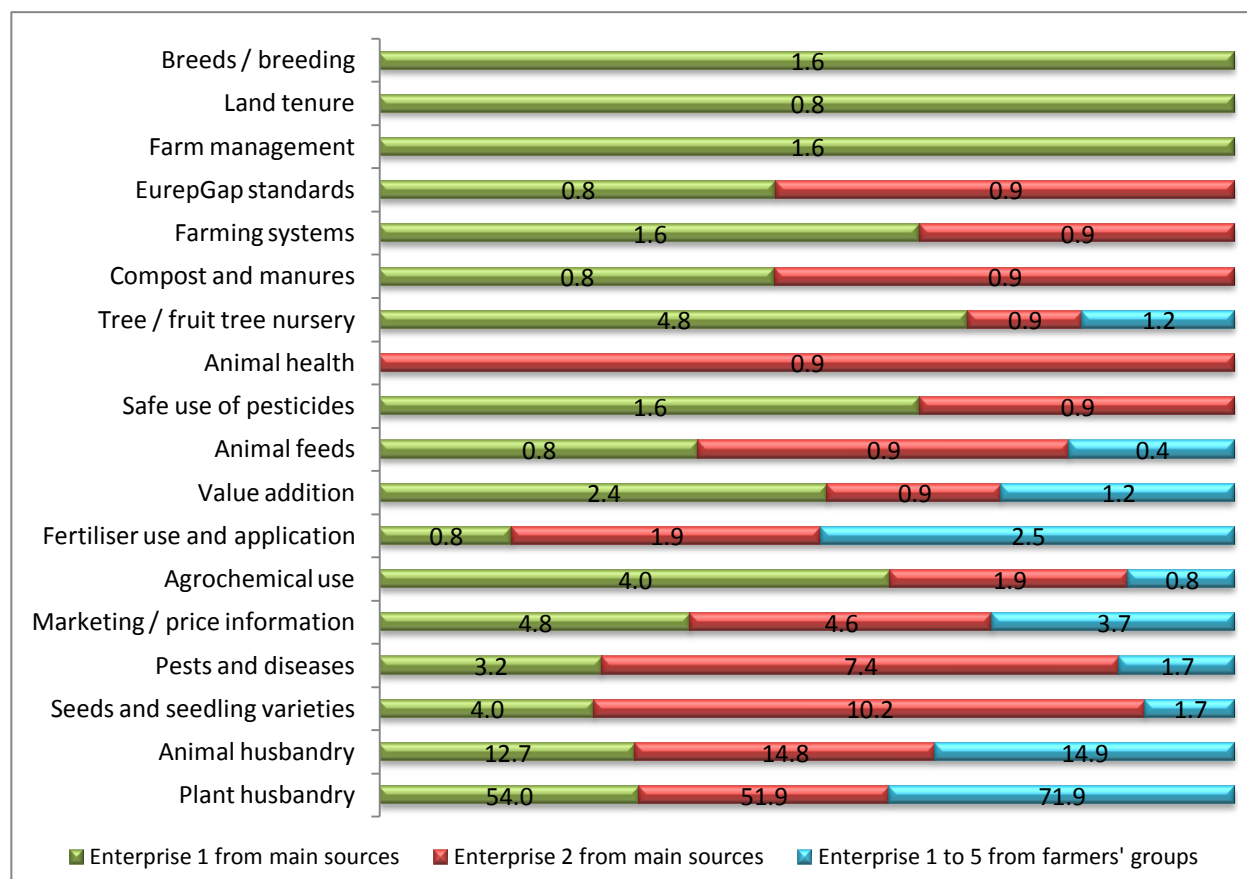
Some are not interactive.

The radio programmes on agriculture are short.

The phone does not help as much as the radio.

## Appendix 121: Analysis of types of information obtained by farmers' groups from the main sources by agricultural themes

N=81 for the enterprise ranked priority number one, N=68 each for the enterprise ranked priority number two and for enterprises ranked priority number 1-5 from farmers' groups



**Appendix 122: Main sources of information and knowledge and the types of information used by farmers belonging to a group from each key source for the enterprise ranked priority number one**

N=96

Source	Type of information obtained				Total (N)
	Awareness	Operational	Technical	Marketing	
Extension officers	21 (14.6%)	73 (50.7%)	42 (29.2%)	8 (5.6%)	144
Private sector	18 (15.8%)	43 (37.7%)	45 (39.5%)	8 (7.0)	114
Neighbours / friends	11 (14.9%)	30 (40.5%)	25 (33.8%)	8 (10.8%)	74
Media	4 (8.9%)	18 (40.0%)	17 (37.8%)	6 (13.3%)	45
Civil society organisations	4 (10.8%)	22 (59.5%)	9 (24.3%)	2 (5.4%)	37
Groups and group members	4 (15.4% )	11 (42.3%)	9 (34.6%)	2 (7.7%)	26
Training and education institutions	0 (0%)	15 (78.9%)	4 (21.1%)	0 (0%)	19
Research institutions	2 (13.3%)	9 (60.0%)	2 (13.3%)	2 (13.3%)	15
Books	1 (9.1%)	3 (27.3%)	6 (54.5%)	1 (9.1%)	11
Own knowledge / experience	1 (11.1%)	7 (77.8%)	1 (11.1%)	0 (0%)	9
Intermediaries	1 (11.1%)	5 (55.6%)	2 (22.2%)	1 (11.1%)	9
Barazas	0 (0%)	4 (80%)	1 (20%)	0 (0%)	5
Field days	1 (50.0%)	1 (50.0%)	0 (0%)	0 (0%)	2
Market places	0 (0%)	0 (0%)	1 (50.0%)	1 (50.0%)	2
Total	68 (13.3%)	241 (47.1%)	164 (32.0%)	39 (7.6%)	512 (100%)

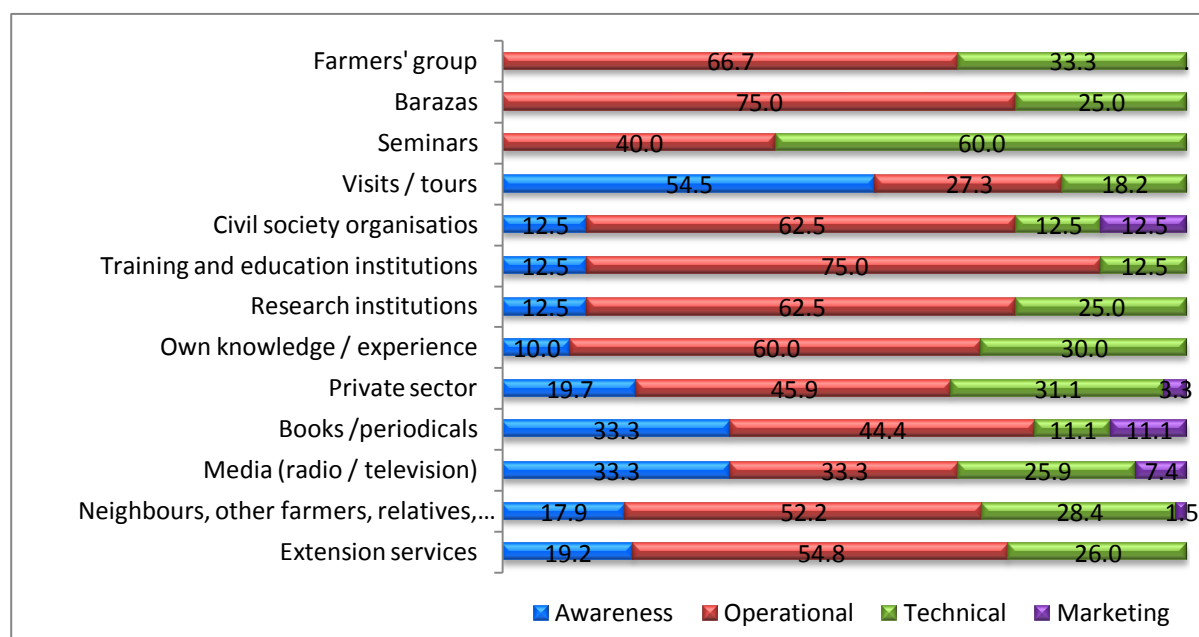
**Appendix 123: Main sources of information for the enterprise ranked priority number two and the types of information obtained from each**  
N=66

Source	Type of information obtained				Total (N)
	Awareness	Operational	Technical	Marketing	
Extension (public sector)	10 (14.1%)	34 (47.9%)	25 (35.2%)	2 (2.8%)	71
Private sector	5 (15.2%)	14 (42.4%)	10 (30.3%)	4 (12.1%)	33
Neighbour	3 (13.6%)	11 (50.0%)	7 (31.8%)	1 (4.5%)	22
Media	2 (22.2%)	1 (11.1%)	6 (66.7%)	0 (0%)	9
Farmers' groups	1 (14.3%)	5 (71.4%)	1 (14.3%)	0 (0%)	7
Local experts	2 (28.6%)	3 (42.9%)	2 (28.6%)	0 (0%)	7
Civil society organisations	1 (100%)	1 (100%)	3 (60%)	0 (0%)	5
Development partners	1 (100%)	2 (40%)	1 (20%)	1 (20%)	5
Training and education institutions	0 (0%)	0 (0%)	1 (100%)	0 (0%)	1
Research institutions	0 (0%)	0 (0%)	1 (100%)	0 (0%)	1
Total	25	71	57	8	161

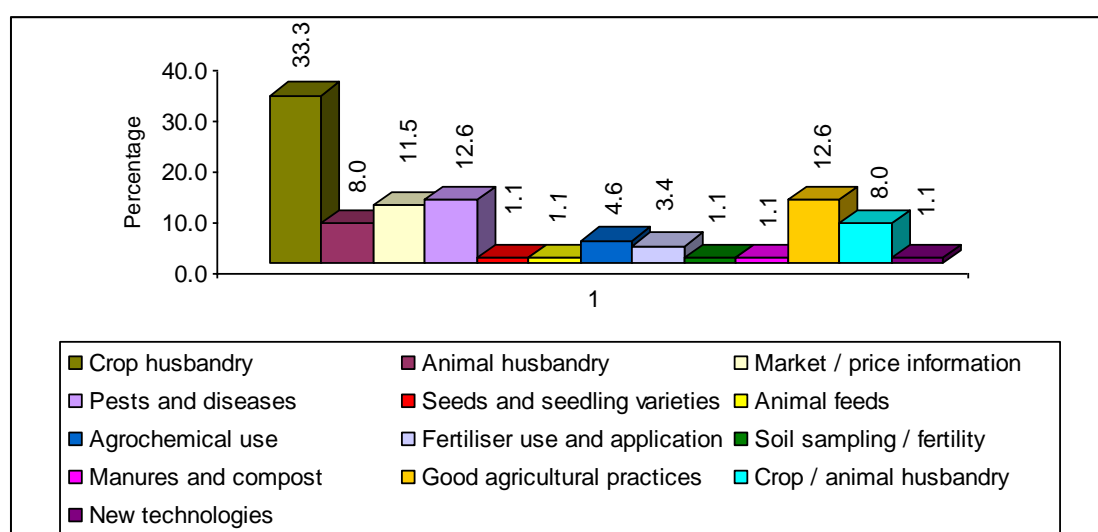
**Appendix 124: Types of information used by farmers belonging to a group from key sources for the enterprise ranked priority number two**  
N=84

Source	Type of information obtained				Total (N)
	Awareness	Operational	Technical	Marketing	
Private sector	14 (15.9%)	29 (33%)	31 (35.2%)	14 (15.9%)	88
Extension services	13 (15.1%)	42 (48.8%)	24 (27.9%)	7 (8.1%)	86
Neighbours	13 (20.3%)	22 (34.4%)	18 (28.1%)	11 (17.2%)	64
Media	7 (18.4%)	13 (34.2%)	13 (34.2%)	5 (13.2%)	38
Markets	5 (26.3%)	3 (15.8%)	4 (21.1%)	7 (36.8%)	19
Farmers' group	3 (30%)	3 (30%)	3 (30%)	1 (10%)	10
Books /periodicals	1 (12.5%)	5 (62.5%)	1 (12.5%)	1 (12.5%)	8
Visits / tours	1 (16.7%)	4 (66.7%)	0 (0%)	1 (16.7%)	6
Barazas	1 (16.7%)	5 (83.3%)	0 (0%)	0 (0%)	6
Civil society organisations	0 (0%)	3 (60%)	0 (0%)	2 (40%)	5
Own knowledge	1 (20%)	2 (40%)	1 (20%)	1 (20%)	5
Intermediaries	1 (25%)	0 (0%)	1 (25%)	2 (50%)	4
Training and education institutions	0 (0%)	1 (100%)	0 (0%)	0 (0%)	1
Total	60	132	96	52	340

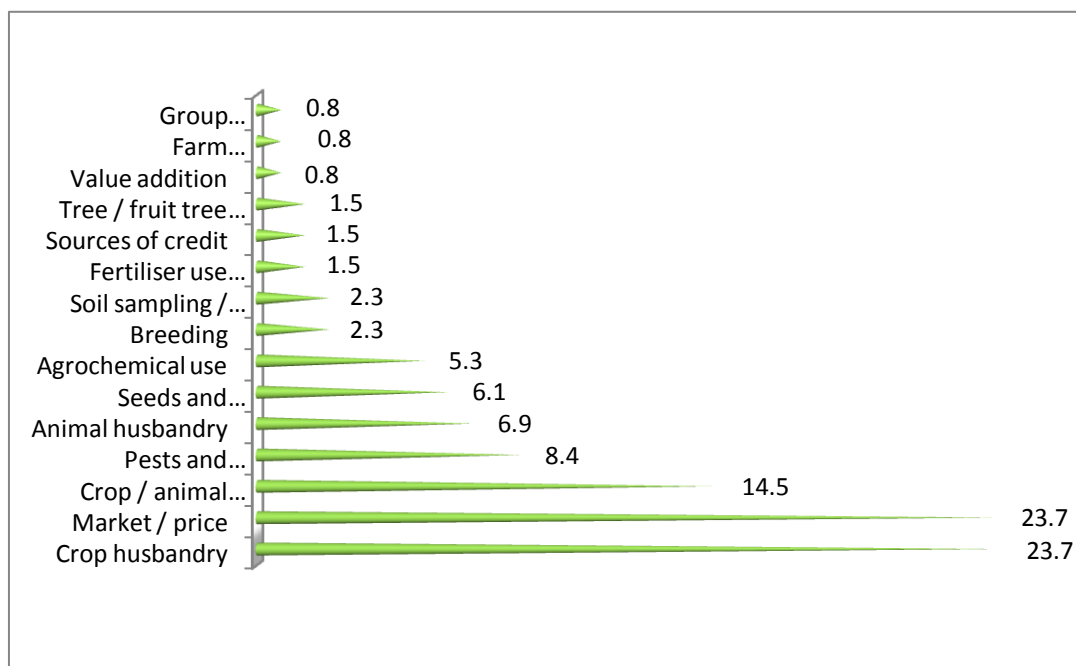
**Appendix 125: Types of information used by farmers not belonging to a group from each key source for the enterprise ranked priority number one**  
N=68



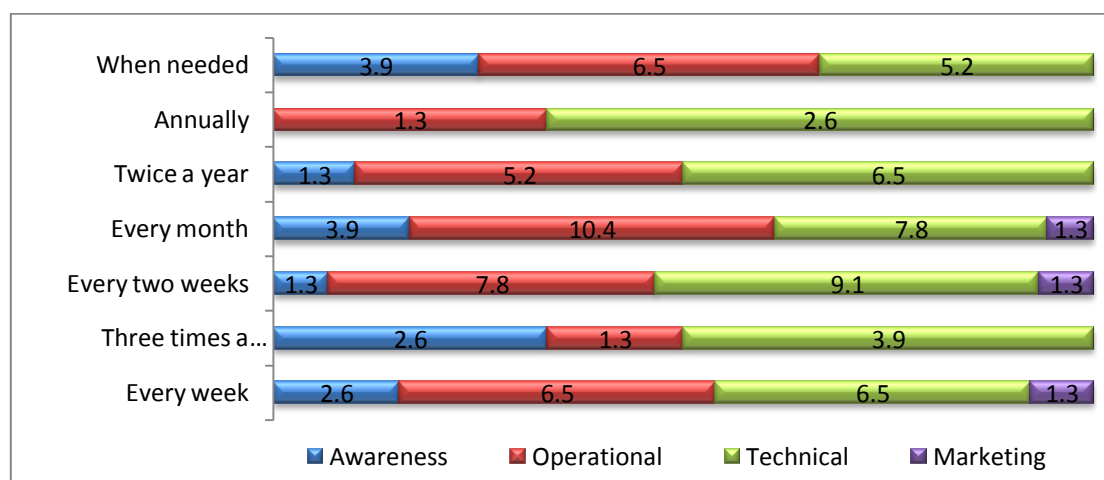
**Appendix 126: Types of information obtained from main sources by farmers not belonging to a group for the enterprise ranked priority number two**  
N=54



**Appendix 127: Types of agricultural information obtained by farmers belonging to a group from their group for the enterprise(s) ranked priority number one to five**  
N=74



**Appendix 128: Frequency of obtaining the different types of information for enterprise ranked priority number one from the main sources by farmers' groups**  
N=48





**Appendix 129: Knowledge network analysis – frequency of use of key sources in Kirinyaga district by type of information and frequency of use**

Type of information Source	Division	Strategic	Operational	Technical	Policy	Market
Agrochemical companies	Central	–	4	4	–	–
	Gichugu	1	3	3	–	–
Agro-processors	Central	–	4	4	–	–
Christian Community Service (CCS)	Gichugu	3	2	2	1	–
	Central	–	4	4	–	–
Coffee societies	Gichugu	2	1	2	2	4
	Central	–	3	3	2	4
	Ndia	3	1	1	2	4
Dairy Goat Association of Kenya	Central	3	4	3	–	5
	Ndia	4	2	3	1	4
	Gichugu	3	3	4	4	5
Jomo Kenyatta University of Agriculture and Technology	Ndia	4	2	5	3	–
	Central	–	5	5	–	–
	Gichugu	3	4	4	1	1
Extension	Ndia	3	4	4	5	1
	Central	4	5	5	5	2
	Mwea	2	4	4	4	2
	Gichugu	3	4	4	5	2
Extension - Forest	Central	4	4	5	3	1
Farmers' groups	Gichugu	3	3	2	2	4
	Mwea	3	4	3	1	4
	Ndia	3	3	1	–	4
Financial institutions	Central	–	–	–	–	–
Friends	Central	3	4	2	–	3
	Ndia	4	1	2	1	4
Horticultural exporters	Mwea	2	4	4	4	5
	Ndia	3	4	4	2	3
	Gichugu	3	4	3	3	4
International organisations (GTZ, ICIPE)	Central	–	4	4	–	–
Kenya Tea Development Agency	Central	3	5	5	2	4
	Ndia	2	4	4	–	–

	Gichugu	3	4	4	4	5
Markets (Wanguru, Makutano)	Mwea	–	–	–	–	5
(Kutus, Kagumo, Kerugoya, Kibirigwi)	Gichugu	2	1	–	–	4
	Central	–	–	4	–	5
(Kagio, Baricho, Sagana, Kibingoti)	Ndia	3	1	1	–	5
Media	Gichugu	3	2	3	4	3
	Ndia	3	2	4	3	4
	Mwea	3	3	4	4	4
MIAD / NIB	Mwea	2	1	3	2	–
Neighbours	Gichugu	3	2	3	–	4
	Ndia	3	5	2	1	5
	Central	–	3	2	–	3
	Mwea	2	5	3	–	4
NGO - Africa Harvest	Gichugu	3	4	4	–	–
NGO - Drumnet	Gichugu	?	4	4	–	–
NGO - Kenya Institute of Organic Farming (KIOF)	Central	3	4	4	1	–
NGO - TechnoServe	Gichugu	–	–	–	–	4
NGO (African Harvest)	Central	1	5	5	–	4
NGO (KENDAT, TechnoServe)	Mwea	1	2	4	–	3
NGO (SACDEP)	Ndia	3	4	4	–	–
NGO (TechnoServe)	Central	–	–	–	–	4
Parastatal (Agricultural Finance Corporation)	Central	4	4	4	4	–
Private sector	Central	3	4	3	2	–
Private vets	Mwea	–	3	3	–	4
Relatives	Central	5	4	3	–	4
Research institutions	Mwea	1	3	5	–	–
	Ndia	4	2	5	3	–
	Central	–	3	5	2	–
	Gichugu	2	1	5	4	–
Seed companies	Gichugu	1	2	4	–	–
	Central	–	4	4	–	–

Stockists	Mwea	—	4	4	—	—
	Gichugu	2	3	2	—	—
	Ndia	—	3	3	—	—
	Central	—	3	4	—	—
Traders	Mwea	—	—	—	—	4
Training institutions (Kamweti)	Gichugu	3	4	4	1	1
	Central	4	5	5	4	1
Transporters	Central	—	—	—	—	4

**Appendix 130: Knowledge network analysis of Central division – Sources, types of information and frequency of use**

Type of information	Strategic	Operational	Technical	Policy	Market
<b>Source</b>					
Input stockists	–	3	4	–	–
Market places / market points	–	–	4	–	5
Parastatals (Agricultural Finance Corporation)	4	4	4	4	–
<b>Ministry of Agriculture</b>	4	5	5	5	2
Private sector	3	4	3	2	–
International organisations (GTZ, ICIPE)	–	4	4	–	–
Friends	3	4	2	–	3
<b>Neighbours</b>	–	3	2	–	3
Transporters	–	–	–	–	4
Relatives	5	4	3	–	4
NGOs (Africa Harvest)	1	5	5	–	4
NGOs (TechnoServe)	–	–	–	–	4
Kenya Tea Development Agency (KTDA)	3	5	5	2	4
Research institutions (KARI)	–	3	5	2	–
Financial institutions	–	–	–	–	–
Dairy Goat Association of Kenya	3	4	3	–	5
Seed companies (Syngenta)	–	4	4	–	–
Coffee societies	–	3	3	2	4
Agrochemical companies	–	4	4	–	–
Forest Officers	4	4	5	3	1
Christian Community Services (CCS)	–	4	4	–	–
Training institutions (Kamweti Agricultural Training Centre)	4	5	5	4	1
Education institutions (Jomo Kenyatta University of Agriculture and Technology)	–	5	5	–	–
Kenya Institute of Organic Farming (KIOF)	3	4	4	1	–
Agro processors	–	4	4	–	–

**Appendix 131: Knowledge network analysis of Gichugu division – Sources, types of information and frequency of use**

<b>Type of information Source</b>	<b>Strategic</b>	<b>Operational</b>	<b>Technical</b>	<b>Policy</b>	<b>Market</b>
<b>Neighbour</b>	3	3	2	—	4
<b>Extension</b> (field days, show, demonstrations, training)	3	4	4	5	2
<b>Research</b> (KARI)	2	1	5	4	—
Seed companies	1	2	4	—	—
Agrochemical companies	1	3	3	—	—
Stockists	2	3	2	—	—
<b>Media</b> (radio - vernacular)	3	2	3	4	3
Training and education institutions (Kamweti / JKUAT)	3	4	4	1	1
KTDA extension	3	4	4	4	5
Coffee cooperative society	2	1	2	2	4
<b>Horticultural exporters</b> (Frigoken)	3	4	3	3	4
Market centres (Kutus)	2	1	—	—	4
Farmers' groups	3	3	2	2	4
NGO - TechnoServe	—	—	—	—	4
NGO - Africa Harvest	3	4	4	—	—
NGO - Drumnet	?	4	4	—	—
Christian Community Service (CCS)	3	2	2	1	—

**Appendix 132: Knowledge network analysis of Mwea division – Sources, types of information and frequency of use**

Type of information Source	Strategic	Operational	Technical	Policy	Market
Extension (field days, show, demonstrations, training)	2	4	4	4	2
Neighbours and relatives	2	5	3	—	4
Input supplier (Agrovet, Stockist)	—	4	4	—	—
Market centres (Kagio, Kutus, Wanguru, Makutano)	—	—	—	—	5
Researcher	1	3	5	—	—
NGOs (KENDAT, TechnoServe)	1	2	4	—	3
Media (Radio, TV, Newspapers)	3	3	4	4	4
Farmers' groups	3	4	3	1	4
MIAD / NIB	2	1	3	2	—
Private vets	—	3	3	—	4
Horticultural exporters	2	4	4	4	5
Traders	—	—	—	—	4

**Appendix 133: Knowledge network analysis of Ndia division – Sources, types of information and frequency of use**

<b>Type of information Source</b>	<b>Strategic</b>	<b>Operational</b>	<b>Technical</b>	<b>Policy</b>	<b>Market</b>
Extension	3	4	4	5	1
Neighbour / relatives	3	5	2	1	5
Friends	4	1	2	1	4
Media (radio)	3	2	4	3	4
Cooperatives	3	1	1	2	4
Research institutions (KARI)	4	2	5	3	–
Education institutions (JKUAT)	4	2	5	3	–
NGO (SACDEP)	3	4	4	–	–
Stockists	–	3	3	–	–
Kenya Tea Development Agency	2	4	4	–	–
Farmers' groups	3	3	1	–	4
Market points (Baricho, Kibingoti, Kibirigwi, Makutano, Sagana, Kagio, Kutus)	3	1	1	–	5
Horticultural exporters	3	4	4	2	3
Dairy Goat Association of Kenya	4	2	3	1	4

## **Appendix 134: Types of information and knowledge obtained from key sources in each division**

### **Central division - types of information and knowledge obtained**

**Appendix 130** shows the main sources of information in Central division, the types of information farmers obtained from each source and the frequencies of use. The principle sources of agricultural knowledge and information in Central division were extension, neighbours and the media (see **section 8.2.5**).

- i) Extension was seen to be strong in providing operational, technical, policy (frequency of 5 for each) and strategic information (4), but weak in market information (2).
- ii) Neighbours emerged as average importance, and were perceived to be strong in operational (3) and market information (3), but weak in technical information (2).
- iii) Although the media emerged third in importance (see **section 8.2.5**), the RAAKS data did not pick up media at all. The private sector was considered an important actor in Central division in providing operational (4), technical, strategic (3) and policy information, but weak on for policy information (2).

### **Gichugu division - types of information and knowledge obtained**

The knowledge network analysis for Gichugu division presents the key sources, types of information and frequencies of use of information (see **Appendix 131**). Results on the major sources of information identified in **section 8.2.5** for Gichugu indicated that:

- i) Extension was perceived to be a very important actor that was very strong on policy (5), operational (4) and technical (4) information, but of average importance in strategic information (3), and weak in market information (2).
- ii) Private sector sources, for example horticultural exporters were viewed as important in providing operational (4), marketing (4) technical (3), strategic (3), and policy (3) information. Farmers explained that some horticultural exporting companies had employed technical experts who were resident in the community and provided technical backstopping whenever they needed help. Horticultural exporters also provided a ready market for farmers' produce and collected the produce from the farmers' groups at the marketing sheds.
- iii) Neighbours were considered an important source that provided operational (3), strategic (3), technical (2) and market (4) information.

### **Mwea division - types of information and knowledge obtained**

Findings on the use and frequency of use of the different types of information for the top three sources of information and knowledge as portrayed by the network analysis table of use for Mwea division (see **Appendix 132**) showed that:

- i) Overall, private sector sources (input stockists, horticultural exporters, the cotton ginnery and rice millers) were perceived to be very important and provided operational and technical information. In particular, horticultural exporters were considered very important and strong in providing market information, strong in providing operational, technical and policy information but weak in strategic information. **Appendix 132** depicts the frequencies of use of the specific private sector actors.



- ii) Extension was considered to be an important and strong source of information that provided operational (4), technical (4) and policy (4) information, but was weak in strategic (2) and marketing (2) information.
- iii) Neighbours, relatives and friends in Mwea were perceived to be important as they provided operational (5), marketing (4) and technical (3) information but were weak on strategic information (2).

#### **Ndia division - types of information and knowledge obtained**

**Appendix 133** presents the knowledge network analysis of use of the important sources of information in Ndia division and the different types of information used and their frequencies of use. Results on the three key sources showed that:

- i) Farmers perceived extension to be an important source of information that was strong on operational (4), technical (4) and policy (5) information but very weak on marketing information (1). However informants pointed out that extensionists were few in number hence were not easily accessible.
- ii) Among the private sector actors, horticultural exporters were considered to be an important source that provided operational (4) and technical (4) information, average on market (3) and strategic (3) information, and weak on policy information (2).
- iii) Neighbours and friends were perceived to be two separate actors in Ndia division. Neighbours were considered important sources that were strong on marketing (5) and operational (5), average on strategic (3) and weak and very weak on technical (2) and policy (1) information respectively. Results indicated that friends were strong in providing strategic and market information.

In addition to the sources presented above, farmers' groups were seen to be important and strong on market information, of average importance on operational and strategic information but weak on policy information (see **Appendix 133**).

### Appendix 135: Knowledge network analysis of use made of key sources in Central division

Use Source	Image / Opinion formation	Determination of needs	Comparison of alternatives	Implementation of solution
Stockist	—	—	—	5
Neighbour	3	3	3	—
Relative	4	3	3	4
Media	3	1	—	—
Extension	4	4	4	5
NGOs	2	2	3	3
Research institutions (KARI)	4	4	4	5
International organisations (ICIPE)	4	4	4	5
Financial institutions	—	—	—	—
Agrochemical companies	4	3	3	5
KTDA	1	2	—	5
DGAK	1	2	—	5
Coffee cooperatives	1	2	—	5
Markets	—	—	—	—
Training institutions (KATC)	4	4	4	5
Agro processors	—	—	—	—

### Appendix 136: Knowledge network analysis of use made of key sources in Gichugu division

Use Source	Image / Opinion formation	Determination of needs	Comparison of alternatives	Implementation of solution
Extension	3	3	2	4
Media (vernacular radio)	3	3	1	2
Stockists	2	1	1	3
Markets (Kutus)	2	1	1	—
Training institutions (KATC)	4	3	4	3
Neighbours other farmers	3	2	3	3
Coffee cooperative societies	1	1	—	1
KTDA extension	3	2	—	4
Horticultural exporters	2	4	—	4

### Appendix 137: Knowledge network analysis of use made of key sources in Mwea division

Use Source	Image / Opinion formation	Determination of needs	Comparison of alternatives	Implementation of solution
Extension	3	3	3	2
Neighbours and relatives	4	4	2	3
Input supplier (Agrochemicals, Stockist, seeds companies)	3	2	2	3
Market centres (Kagio, Kutus, Wanguru, Makutano)	4	1	4	–
Researcher	3	2	3	2
NGOs (KENDAT, TechnoServe)	3	1	–	4
Media (Radio, TV, Newspapers)	4	1	–	2
Farmers' groups	4	4	1	3
MIAD / NIB	1	3	3	1
Private vets	3	2	3	4
Horticultural exporters	4	4	–	4
Traders	4	–	2	1

### Appendix 138: Knowledge network analysis of use made of key sources in Ndia division

Use Source	Image / Opinion formation	Determination of needs	Comparison of alternatives	Implementation of solution
Neighbour	3	–	4	3
Extension	3	4	4	4
Media	3	2	3	2
Farmers' groups	3	3	1	3
Stockists	1	2	1	3
Horticultural exporters	2	–	–	4
Market information (market points)	3	–	3	2

## **Appendix 139: Analysis of Knowledge network analysis of use made of key sources in Gichugu, Mwea and Ndia divisions**

### **Gichugu division - Knowledge network analysis of use made of key sources**

**Appendix 136** presents the knowledge network analysis table of use for Gichugu division. Findings on the use made of the three key sources identified in **section 8.2.4** for Gichugu division showed that:

- Extension information was used for image formation (4), identification of problems or needs that required intervention (3), to help evaluate available options (2) and for implementation of solutions (4).
- Private sector sources, for example the KTDA, horticultural exporting companies and stockists were considered important sources that provided information that was used for image formation, determination of problems and areas requiring intervention, and for implementing selected solutions or interventions. Information obtained from stockists was used to compare alternative solutions or options. The frequencies of use for each of the private sector sources are shown in **Appendix 136**.
- Information from neighbours and other farmers was used for image formation (3), determination of problems and needs that required intervention (2), for evaluating possible options (3), and for execution of a solution or intervention (3).

### **Mwea division - Knowledge network analysis of use made of key sources**

**Appendix 137** presents the knowledge network analysis table of use for Mwea division. Results on the use made of the three most important sources in Mwea division as identified in **section 8.2.4** showed that:

- Private sector sources (input suppliers, horticultural exporters, traders and private veterinary clinicians) were used to help in image formation, for identification of problems or needs that required intervention, to help evaluate available options and for implementation of solutions. The frequencies of use of specific private sector sources are shown in **Appendix 137**.
- Extension information was used for image formation (3), for identification of problems or needs that required intervention (3), to help evaluate available options (3) and for implementation of solutions (2).
- Information from neighbours was used for image formation (4), for identification of problems or needs that required intervention (4), to help evaluate available options (2) and for implementation of solutions (3).

Information obtained from farmers' groups was used for image formation (4), for identification of problems or needs that required intervention (4), to help evaluate available options (1) and for implementation of solutions (3).

### **Ndia division - Knowledge network analysis of use made of key sources**

**Appendix 138** presents the knowledge network analysis table of use for Ndia division. Results on the use made of the first three sources identified for Ndia division in **section 8.2.4** showed that:

- Extension information was used for image formation (3), for identification of problems or needs that required intervention (4), to help evaluate available options (4) and for implementation of solutions (4).

- Information from the private sector sources such as stockists and horticultural exporters was used for image formation (1), for identification of problems or needs that required intervention (2), to help evaluate available options (1) and for implementation of solutions (3). Information from horticultural exporters was used for image formation (2) and for implementation of solutions (4).
- Information from neighbours was used for image formation (3), to help evaluate available options (4) and for implementation of solutions (3).
- It was noted that results of the knowledge network analysis of Ndia on use of information did not highlight research and NGOs as key sources.
- Information from the radio was used for image formation (3), for identification of problems or needs that required intervention (2), to help evaluate available options (3) and for implementation of solutions (2).
- Other important sources categorised by use to which the information was put in Ndia division included farmers' groups and markets (see **Appendix 138**).

#### **Appendix 140: Examples of how small-scale farmers used external agricultural information**

##### **Group management**

We called the *Ministry of Gender and Social Development* and they trained us on group dynamics and management

##### **Crop production**

I learned about an improved maize variety that was high yielding, fast-maturing and was appropriate for the area and I bought it from the *stockist* and planted.

Following training by a *seed supplier*, I decided to use the "green challenger" variety of cabbage and the results were good. We learned about growing TCB from *Africa Harvest* and adopted the technology.

*Christian Community Service (CCS)* resource persons from USA trained us on how to grow tissue culture bananas and productivity increased.

I learned about good coffee husbandry (pests, chemical use and pruning) from an *extension officer* and adopted the improved methods and my production was high.

I used information from a *coffee factory* and *extension workers* that has helped me improve coffee production.

I applied knowledge from an *extension officer* on water harvesting through cutting off drains for banana production and obtained a very good crop.

I planted beans as recommended by the *extension officer* and obtained higher yields.

We learned how to make manures using plant materials following training from *agricultural extension officers*, which we are using in farming.

I applied new knowledge from a *demonstration* done by an *extension officer* on my farm on improved (hybrid seed, fertiliser) methods of growing maize and harvested a good crop.

I learned about grafting of coffee seedlings from the *extension officer* and was able to increase my knowledge and improve my farming practices.

I listened to a *radio* programme on coffee pruning, and tried it out. The results were positive.

I used information from *the radio* on the use of compost manure in place of fertiliser and it worked.

I applied information I heard over the *radio* regarding an agrochemical (Octiva) to control French bean rust disease and it was effective.

I listened to a *radio* programme on growing arrow roots during the short rain period and tried it out and obtained high production.

I heard about foliar feeds over the *radio* and tried to use it on my crops and it helped increase production.

I listened to a *radio* programme that advised farmers to deworm their cows after every three months and adopted and my cows are healthy.

Last season my French bean crop was diseased and when I called Frigoken (*horticultural exporting company*), they responded very fast and recommended a pesticide that I used and my crop was saved.

My *neighbour* trained me on how to apply fertiliser and manure to coffee to improve production.

Using information I obtained from an *agricultural show*, I used Bio-Fix to grow beans to improve yields.

I bought certified seed of passion fruit from *KARI-Embu* and planted and later grafted them on the local variety.

Our group attended a seminar at **KARI** and were trained on good farming practices and new technologies. I applied knowledge acquired from **ICIPE** on integrated pest management and sprayed my tomatoes on an experimental basis and this boosted my income.

I attended a one week seminar organised by the **Community Capacity Support Programme (CCSP)** on tree grafting and I am now able to graft my mango trees and for other farmers.

I learned about appropriate pesticides to use in tomatoes and market price information for tomatoes and French beans from my **sellers of chemicals** and used the information to improve productivity and profits.

I attended a **field day** and decided to adopt the practice by growing bananas along contours.

I attended a **field day** on tea organised by **KTDA**, and with help from KTDA experts I was able to prune my tea properly.

I followed advice from my **group** on when to plant and harvest tomatoes so as to coincide with the best season for selling and we are getting good prices.

### **Animal production**

I attended a NALEP **baraza** and heard how groups could use agricultural officers to improve farming.

I acquired new knowledge on breeding goats to avoid inbreeding from **DGAK**, and joined a dairy goat group that bought an improved **duck** for breeding our goats.

Training from **DGAK** equipped us with skills to manage goat diseases and good husbandry.

We learned about beekeeping from the animal production officer and **Ngong Agricultural Training Centre** and started bee farming.

I was trained on rabbitry at **KATC** and started keeping rabbits.

The livestock **extensionist** trained us on poultry farming and we are now keeping broilers.

My group invited the **livestock officer** who trained us on poultry keeping and we started poultry farming.

I applied information from a **livestock extension officer** and used concentrates, vitamins and minerals (Maclick super, DCP, cotton seed cake and multivitamins) for my cow to address the problem of calcium deficiency.

I applied knowledge acquired from the **livestock officer** on building a zero grazing unit, good breeds, feeding and husbandry of dairy cow and production improved.

I attended training on dairy farming by **extension staff** and additional information over the **radio** and it helped me attain high milk yields.

I learned about dewormers from a **stockist (private sector)** and bought the product to improve the health of my goats.

I learned about dry matter from a **neighbour** and used dry matter (maize stover, rice straw) for feeding cows and saved on fodder utilisation.

I learned how to manage layers (improved breed) from my **neighbour**.

I acquired information on new technologies through **field tours** and have improved my dairy cow farming.

I applied knowledge attained from training by **KARI-Muguga (research)** of using napier grass and Desmodium to feed cows.

I applied knowledge obtained from the **NIB-MIAD (research)** on rice growing using certified seed and pesticides.

### **Pest and disease management**

I learned about the push - pull technology for controlling maize stalk borer from **KARI** and we adopted it as a group to control pests.

Following advice from **seed and agrochemical companies**, I have adopted a tomato variety that is appropriate for my area / market and have managed to effectively control pests / diseases

An **agrochemical agronomist** trained us about growing French beans and planting schedule and our yields improved.

I obtained information from Osho Chemicals (an **agrochemical company**) on a chemical that I successfully used to control mites.

I used information on diagnosis of a pest from a **poster** with a photo showing a diseased banana leaf and was able to diagnose and manage the disease on my farm.

The **extension officer** advised me on what chemical to use on coffee and I bought it and sprayed and the berries were not damaged.

I attended a **field day** on biological control of Diamond black moth (DBM) which was a threat to bean pods and applied the knowledge on my bean farm.

I learned about what agrochemical to use to control brown spot and woodiness in passion fruit.

Training from **KPCU** helped me to produce coffee and control pests and diseases.

My French beans had a problem and after getting wrong advice from my neighbour, I visited the **input stockist** and explained my problem and he advised me to buy Octiva, which gave me good results.

I acquired information on new crop pesticides from the local stockist that I used on crops.

My tomatoes were infested with red spider mites and after consulting my **neighbour**, I was advised on what chemical to use.

I have applied information on safe-use of pesticides, correct spacing and new technologies such as tissue culture banana.

**Soil fertility and improvement**

I learned how to make terraces and plant multipurpose trees and napier from an *extension officer*. I applied the knowledge to control erosion, conserve soil and increase yields.

I attended training at *KIOF* on organic farming and applied the skills on my farm. My soils were very poor but have improved.

**Appendix 141: Examples of decisions made by farmers' groups, questions they asked at the time of deciding on the enterprise and how they obtained information****Medicinal plants and tree nursery**

We had many problems and lacked money so we decided to start the Stinging nettle project to make traditional medicines and sell, and a tree nursery. The proceeds from the enterprises would then be shared among members and who could also take loans. Questions asked included Where do we find information on processing the Stinging nettle? How do we package it? How do we sell it? For how much show we sell it? The group obtained answers from a lecturer from University of Nairobi and external visitors from abroad as well as from elders in the community who had local knowledge on Stinging nettle. Information on establishing a tree nursery was obtained from elders and from the Forestry officer.

The area around our sub-location was very dry and people had cut down all trees so we decided to establish a trees and fruit trees nursery so as to provide community members with seedlings to improve the environment. Questions asked included: How do we establish a nursery? What trees do we plant? Where do we get seeds to plant? Where do we get water for the seedlings? We obtained answers to our questions from a group member and from elders in the community.

**Cotton**

Cotton used to be grown before but was abandoned. The agricultural extension officer told us that the prospects for cotton production now looked good so we decided to grow cotton. The yields were however low and the enterprise was not profitable. The youth members decided to abandon the crop and only the older people are still producing cotton. Questions asked included: How profitable will the enterprise be? Will the enterprise withstand the dry weather? Will we become rich? Who will show us how to grow the new variety? Where shall we get seeds from? The group obtained answers from KARI in Mwea, extension officers and from the older people who had grown cotton for many years.

**Value addition**

Following failure by the Kirinyaga Dairy to pay farmers for milk delivered and problems relating to milk brokers, we decided to form our own group - Mutira Maziwa to market and add value to our produce. Questions asked included: How do we make yoghurt? How do we ferment the milk? For how much should we sell the milk? Where should we establish our cottage industry? The group obtained answers from the livestock extension officer and an expert from Nairobi who trained them on processing milk.

**Dairy goats**

There was high demand for goats milk so our group decided to embark on dairy goat farming using an improved dairy buck to improve the breeds and increase milk yields. Questions asked included: Where do we get a buck from? How do we manage the exotic goat breed? How much milk shall we get per goat? Where shall we get fodder from? The group obtained answers from the livestock extension officer, other dairy goat groups and from DGAK.

We are a group of disabled people who got together to reduce poverty and hunger and share ideas and solve problems. We decided to keep dairy goats and we now get milk for our households. Questions asked included where do we get money to buy the goats? Where shall we get the improved buck from? Will the goats yield sufficient milk? Who will train us on how to look after the goats? The group obtained answers from another goat rearing group and from a development institution which bought goats for the members. The group was trained by DGAK and by extension officers.

## **Appendix 142: Examples of questions that farmers' groups asked at the time of deciding on an enterprise**

### **Choice of enterprise**

What enterprise could substitute French beans and tomatoes and be economically viable?  
Which enterprise could we undertake to get maximum profits?

### **Market**

Where shall we find market for our produce?  
What shall we do if we do not find a market for our produce?  
We used to see vehicles passing and collecting milk from some farmers and asked ourselves "if we get together wouldn't we find a market for our milk?"  
Where shall we get transport?  
Are we assured of a market with Frigoken?

### **Increase yields / productivity**

How can we improve maize yields?

### **Income generation**

How can the group generate income?  
What enterprise should we adopt?  
Will fish earn us income?  
Will we generate much income from grafted mangoes?  
How much income will the dairy cows generate?

### **Production resources**

Where shall we get seeds to plant in the tree nursery?  
Where do we get good quality chicks?  
Where shall we get the goats and the buck from?  
Where and how do we get dairy cows?  
Where shall we source the banana plantlets from?

### **Food security**

What should the group do to alleviate poverty?

### **Fodder**

Where shall we find seeds for cotton and information on husbandry?

### **Food and nutrition**

How do we solve the problem of milk shortage for the household?

### **Soil / environment conservation and fertility**

How can we conserve our soils, make our lands fertile and beautiful?

### **Training, information and knowledge**

Who will train new group members?  
What can we do to be able to produce French beans throughout the year?  
How much sweet potatoes should we produce?  
What kind of structure should we put up for a collection shed?

### **Credit and microfinance**

Where shall we get money to buy the goats?  
Where shall we get the capital required to implement the enterprise?  
Will we be able to service the loan?  
Where shall we get the start up capital?



**Appendix 143: Feelings or emotions of satisfaction by farmers belonging to a group in connection with decision(s) about choice of enterprise(s)**

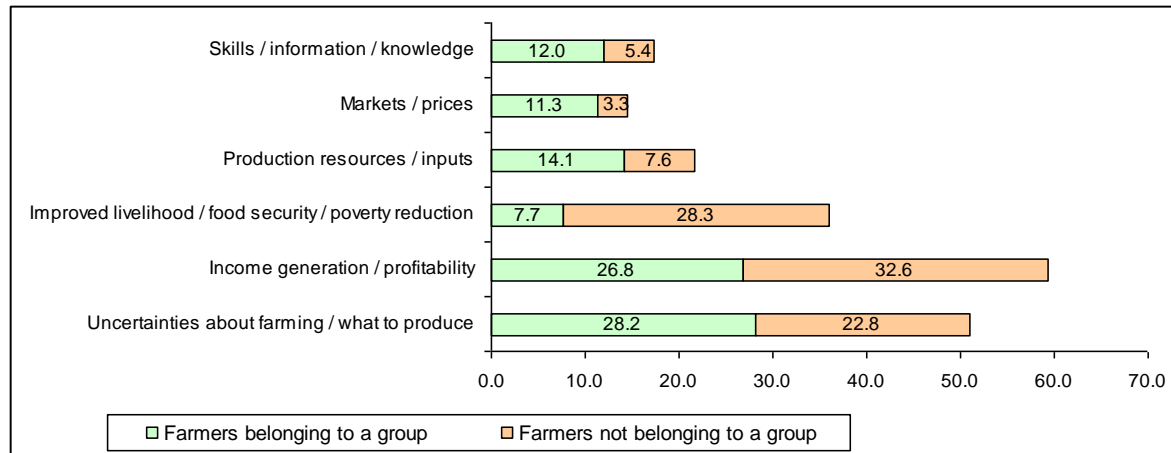
<b>Feelings of satisfaction</b>	
<p><b><i>Linked to income generation</i></b></p> <p>“I feel that the dairy goat has improved people's livelihood, tissue culture banana had eradicated poverty and horticulture has increased income”</p> <p>“I was feeling eager to raise food and income for my family”</p> <p>“I was about to retire and wanted another source of income”</p> <p>“The enterprise generates income on a daily basis”</p> <p>“I felt these could be better enterprises for the future and profitability could be increased through increased production”</p> <p>“I considered all the benefits of cotton - the fibre, value addition, cotton seed oil, cotton cake and felt it was a profitable enterprise”</p> <p>“I felt I should reduce the acreage of my other enterprises and expand the horticulture enterprise”</p> <p>“I inherited coffee on the farm and decided to add bananas and horticulture because coffee was no longer earning good money”</p> <p>“I wondered if income would be forthcoming if I developed the enterprises fully”</p> <p>“I felt the enterprises selected were a good source of income”</p> <p>“I did not want to stay idle so I felt I could generate income through farming and have food for the family. I felt that through a group, I could improve the farm”</p> <p>“The decision to grow maize has helped me to sell and get income but not so much because of lack of irrigation water”</p>	<p><b><i>Linked to provision of food and ensuring food security</i></b></p> <p>“I feel that the dairy goat has improved people's livelihood, tissue culture banana had eradicated poverty and horticulture has increased income”</p> <p>“I was feeling eager to raise food and income for my family”</p> <p>“I felt that with the enterprises selected (maize, beans, poultry), there was enough food”</p> <p>“I felt I should consider the enterprises that would provide food for my family and those who were fast growing”</p> <p>“I felt I should concentrate more on maize so that my family is food secure”</p> <p>“I did not want to stay idle so I felt I could generate income through farming and have food for the family. I felt that through a group, I could improve the farm”</p>
<p><b><i>Linked to production resources and inputs</i></b></p> <p>“The area obtained piped water and I wanted to use the water for horticultural enterprises”</p> <p>“I felt that tissue culture bananas were easy to produce as they did not require spraying”</p> <p>“I felt that the dairy cow was easy to rear as one only needs to feed it”</p> <p>“I felt it was good I considered what the labour and investment requirements were”</p> <p>“I felt that maize, beans, bananas and tomatoes were the best for me as I did not need much cash to grow them”</p> <p>“I wish I had more coffee than tea because it is less involving in terms of labour”</p> <p>“I would have preferred to grow horticultural crops which generate income faster but I lack water for irrigation”</p>	<p><b><i>Linked to access to services, information and knowledge</i></b></p> <p>“After working for another farmer that was growing flowers, I felt I could grow my own flowers”</p> <p>“I used to work as for a horticultural farmer as a farm help to earn a living and I envied the money he used to earn. I saved my wages for 2 years (KSh.96,000) (1280 USD) and decided to buy a pump at KSh.25000 (333.33 USD) and pipes and started practicing horticultural crops”</p> <p>“I feel the decision to grow French beans has helped me improve my agricultural activities”</p> <p>“I started producing tomatoes but the enterprise was too expensive to produce so I opted for French beans but I first sought information on the enterprise before starting”</p>
<p><b><i>Linked to improved livelihoods</i></b></p> <p>“I feel that the dairy goat has improved people's livelihood,</p>	<p><b><i>Linked to market / prices</i></b></p> <p>“I wondered if the enterprise were viable, whether</p>

<p>tissue culture banana had eradicated poverty and horticulture has increased income”</p> <p>“I felt self-sufficient due to diversification”</p> <p>“I used to do labour contracts but decided to settle on coffee, banana and maize farming”</p> <p>“I wanted to have enterprises that would generate income and supply all basic human needs in a balanced manner throughout the year”</p>	<p>the soils were good for the enterprises and where I would find a market”</p> <p>“I was motivated to adopt dairy farming because we obtained better prices marketing milk through the group to Tuzo Spin Knit”</p>
<p><b><i>Linked to suitability of the area</i></b></p> <p>“I feel coffee, maize, beans and bananas are most suited for this area”</p> <p>“Felt the enterprise had better market opportunities and that there were seasons that were good for particular enterprise”</p>	<p><b><i>General</i></b></p> <p>“I was happy and satisfied with the decision”</p> <p>“I was motivated”</p>

**Appendix 144: Feelings or emotions of dissatisfaction (farmers belonging to a group) in connection with decision(s) about enterprises**

<b>Feelings of dissatisfaction</b>	
<p><b><i>Linked to markets / prices</i></b></p> <p>“I felt like uprooting and changing the enterprise”</p> <p>“I felt like stopping farming as I was dissatisfied with the poor market and low prices of produce and high costs of inputs”</p> <p>“I felt that if I had not planted tea I would have grown passion fruit”</p> <p>“I wished the marketing channels could be streamlined to improve on the current status”</p> <p>“I am a bit satisfied with French beans but as I get older I would like to concentrate on coffee”</p>	<p><b><i>Linked to income generated and improved livelihood</i></b></p> <p>“We are not happy with the coffee industry so I decided to allow bean and maize demonstrations to be held on my farm and I have learned a lot”</p> <p>“I had no money and was financially unstable and wanted to improve my livelihood”</p>
<p><b><i>Linked to production resources and inputs</i></b></p> <p>“I started producing tomatoes but the enterprise was too expensive to produce so I opted for French beans”</p> <p>“I felt like stopping farming as I was dissatisfied with the poor market and low prices of produce and high costs of inputs”</p>	<p><b><i>General</i></b></p> <p>“I was disappointed with the decision”</p> <p>“I was unhappy with the decision”</p>

## Appendix 145: Broad categories of questions that farmers had at the time of deciding on the enterprise(s)



N=93 for farmers belonging to a group, N=65 for farmers not belonging to a group

## Appendix 146: How the feelings had changed small-scale farmers belonging to a group

<b>Adoption of new enterprise(s) / diversification of enterprises</b> "They helped me diversify my enterprises" "They made me practice crop rotation of horticultural crops" "They made me decide to grow passion fruits" "They made me feel it was the wrong decision to plant tea and coffee" "I decided to lease a water pump and started growing French beans" "I concentrated more on coffee since it was very profitable" "I organised myself and decided on enterprises that would generate income for my family" "I concentrated more on subsistence crops and did away with cash crops" "They made me adopt the enterprise that had a better market and good prices each season" "I tried out dairy farming, tomatoes, sunflower, kale, pigeon peas and sunflower" "I decided to continue with the flower enterprise" "I felt the enterprise could be of help to farmers" "I stopped producing some of the enterprise that I was farming earlier such as sweet potatoes, cassava and French beans"	<b>Improved standard of living</b> "The feelings had helped me invest and raise school fees and money to look after my family" "I attained food self-sufficiency" "I have been able to get milk and income for my family" "I decided to continue with the enterprise because the prices kept fluctuating from low to high"
<b>Improved understanding, farming and yields</b> "They helped me to improve my farming practices and improved yield" "I used manure and the crop was good" "I started consulting extensionists for the best	<b>Started farming as a business</b> "I was a casual labourer but now generate my own income" "I made my farming more commercial" "They made me quit employment and start serious

varieties suitable for my area" "They made me want to know more about dairy farming and improved cows"	farming" "I have taken up farming as a profession I am self employed" "They made me quit employment and practice serious farming"
<b>Other</b> "I joined a microfiche group" "I wondered whether I should drill a borehole to get water for irrigation" "I tried out the enterprises but did not realise my expectations due to climatic changes, price fluctuations"	

**Appendix 147: Feelings or emotions of satisfaction (farmers not belonging to a group) in connection with decision(s) about enterprises**

<p><b>Feelings of happiness and satisfaction</b></p> <p><i>Linked to income generation</i></p> <p>"Coffee can be a good source of income"</p> <p>"The decision to grow rice has brought more positive changes as it generates good income"</p> <p>"The enterprises addressed the needs of the household and improve farm income"</p> <p>"I desired to have food for my family and earn income from farming"</p> <p>"I wondered what else I could have produced to generate good income other than the enterprises I had adopted (French beans)"</p> <p>"Problems of money were the driving force to decide to adopt horticultural crops"</p> <p>"I felt I want to make more money because if I made more money, I would be able to buy another piece of land"</p> <p>"I felt the enterprises earn cash and farming was an alternative way to earning a living"</p> <p>"I felt I should do away with tea and concentrate on more paying enterprises such as dairy and horticulture"</p> <p>"I feel tea was a good enterprise because it provides a monthly income and allows one to access a loan"</p> <p>"Dairy was a good enterprise because it generated monthly income while poultry earned good income"</p> <p>"I grew tea because it would give me a monthly income"</p> <p>"Tea helps in generating income for investment while maize is used at home for food"</p> <p>"The selection was based on the enterprises with the highest returns"</p> <p><i>Linked to improved livelihoods</i></p> <p>"I was eager to earn a living"</p> <p>"The enterprises addressed the needs of the household and improve farm income"</p> <p>"They provided food security and catered for my children's education"</p> <p>"Coffee enables me to pay school fees for my children"</p> <p>"I felt the enterprises earn cash and farming was an alternative way to earning a living"</p> <p>"I felt happy as I needed to get cash to cater for education, food and upkeep of my family from the farm produce"</p> <p>"I felt the need to eradicate poverty"</p> <p>"I felt that farming was the best alternative as it helps somebody to sustain themselves"</p> <p>"They are making life bearable"</p> <p><i>Linked to provision of food and ensuring food security</i></p> <p>"I desired to have food for my family and earn income from farming"</p> <p>"They provided food security and catered for my children's education"</p> <p>"Tea helps in generating income for investment while maize is used at home &lt;for food&gt;"</p>
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***Linked to market / prices***

“I feel the market determines the choice of enterprise”

“I was happy and satisfied but the prices of tea are now falling”

***Linked to ownership and sustainability***

“I feel I have ownership of the enterprise”

***General***

“I felt motivated”

“I am happy but if a new technology emerges that is better paying, I shall change”

“The enterprises helped a bit”

**Appendix 148: Feelings or emotions of dissatisfaction (farmers not belonging to a group) in connection with decision(s) about enterprises**

**Feelings of dissatisfaction**

***Linked to markets / prices***

“The prices of horticultural crops keep fluctuating and I sometimes wonder what enterprise to continue with”

“I feel that at some stage I will uproot some tea and plant food crops so that I do not have to rely on the market for all my food”

“The market for these enterprises is poor as the Horticultural Crops Development Authority does not purchase the products so farmers have no alternative than to sell to middlemen”

“I felt I should buy a cow to generate money and add to the income because the income from coffee was not good”

“I feel disappointed but feel I should wait and see if it will pick or else I will uproot the crops”

***Linked to income generated***

“I was not very satisfied because the returns were not as good as expected”

“I felt I should buy a cow to generate money and add to the income because the income from coffee was not good”

***Linked to production resources and inputs***

“It becomes a bit demoralising when the rains fail and crops don’t do well and there is no money to buy fertilisers so we use manure”

“The farm size is small”

***Linked to access to services and information***

“I felt that farmers belonging to a group were benefiting”

***Linked to ownership and sustainability***

“I hoped to have a sense of self sustainability but this was not achieved”

**Appendix 149: Questions and confusion that farmers not belonging to a group had at the time of making the decision(s)**

**Uncertainties about farming / what to produce**

“Which is the best variety of maize / beans?”

“What should I plant to be able to practice crop

**Income generation / profitability**

“What enterprises would ensure quick returns and long-term investments?”

<p>rotation?”</p> <p>“How can I help myself through farming?”</p> <p>“What enterprises shall I produce that cannot be destroyed by chickens?”</p> <p>“How can I uplift myself from this situation?”</p> <p>“If I plant cash crops might that portion be given away to somebody else?”</p> <p>“Because I do not have education that can get me employment, what will help me in the future?”</p> <p>“Where will I get money for school fees?”</p> <p>“Will the crops do well?”</p> <p>“What would life be like after retirement?”</p> <p>“How will I manage my <i>shamba</i> successfully?”</p> <p>“How do I attain quality and quantity?”</p> <p>“I feared the crops may fail and I may not have food or income”</p>	<p>“What enterprise will earn good income / be more profitable?”</p> <p>“What should I do to get money?”</p> <p>“Will I make enough money?”</p> <p>“Should I stop the small-wage jobs and concentrate on farming?”</p> <p>“I was employed and resigned to practice farming and wondered how and what to produce?”</p> <p>“Why was I not making money?”</p> <p>“Will there be enough income to cater for the family needs?”</p> <p>“Which enterprise would give me accumulated cash?”</p> <p>“What enterprise can earn me fast money?”</p> <p>“What can I do to get money?”</p> <p>“Where will I get money, food, shelter and clothing?”</p> <p>“Will tea generate more money than the crops that were previously being grown such as beans?”</p>
<p><b>Food security, poverty reduction and improved livelihoods</b></p> <p>“Will there be food self sufficiency?”</p> <p>“Will there be enough food for the family?”</p> <p>“Would I have enough food?”</p> <p>“If I do not go into farming, how shall I help my family?”</p> <p>“What enterprise(s) would eradicate poverty?”</p> <p>“How can I sustain myself and my family?”</p> <p>“How can I improve my standard of living?”</p> <p>“How can I solve the problem of food security?”</p> <p>“Should I produce subsistence crops for my household instead of relying on the market?”</p>	<p><b>Production resources and inputs</b></p> <p>“Where can I obtain the inputs (seed, fertilisers)?</p> <p>“Will I get enough capital?”</p> <p>“Where will I get water for irrigation?”</p> <p>“Where will I get land to lease?”</p> <p>“What assets do I have near me?”</p> <p>“If I keep a cow, will I get enough feeds? What about diseases and management of the cow?”</p> <p>“How much land should I allocate for French beans?”</p> <p>“Farm planning - how much land do I set aside for each of the enterprises?”</p> <p>“If only I could get a cow that would give me 20-25 litres of milk, this would sustain my financial needs?”</p>
<p><b>Market(s) and prices</b></p> <p>“Where will I find market for the produce?”</p> <p>“Why are the prices of coffee and tea falling like that?”</p>	<p><b>No questions or confusion</b></p> <p>“None because my parents produced these enterprises so I had learned”</p> <p>“I did not fear keeping poultry because my father used to keep chickens.”</p>

## Appendix 150: How the feelings changed small-scale farmers not belonging to a group

<p><b>Improved standard of living</b></p> <p>“The enterprises helped me change my way of life / standard of living”</p> <p>“I was able to sustain myself and my family”</p> <p>“I had no choice since farming was my source of livelihood and decided to continue with the enterprises chosen”</p> <p>“I had confidence I would succeed and this helped me earn good income for school fees and other family needs”</p> <p>“I am self reliant /my income is secure</p> <p>“I was able to educate my children”</p> <p>“There was food for my family and cash to pay fees”</p> <p>“I started farming, which became successful and enabled me to buy another piece of land and a water pump”</p> <p>“I have a balanced diet and income to clothe and educate my children</p> <p>I am able to stand on my own without relying on my parents”</p> <p>“Even when I have no money, I can sell the produce and get cash”</p>	<p><b>Adoption of new enterprise(s) / diversification of enterprises</b></p> <p>“I changed from growing sweet potatoes as they could not meet my objectives and adopted maize, French beans and tomatoes”</p> <p>“I have produced mangoes, poultry and food crops that have generated a constant source of income”</p> <p>“I invested in these enterprises (maize, bananas, coffee) and have been able to do so much including buying another shamba”</p> <p>“My income was boosted after introducing dairy and horticulture enterprises”</p> <p>“They made me diversify my enterprises so as to earn good income”</p> <p>“I decided to grow maize only”</p> <p>“The change in enterprises enabled me to raise school fees instead of borrowing”</p> <p>“I planted coffee and I am getting income though not enough to sustain my family”</p> <p>“Since I found coffee on the farm when I got married, I decided to try dairy despite challenges like diseases and low milk yields”</p>
<p><b>Improved understanding</b></p> <p>“They made me continue farming”</p> <p>“I decided to grow subsistence crops because the land had not been sub-divided”</p> <p>“They made me start looking for more information on how to produce and market the enterprises”</p> <p>“After attending some field days and learning improved practices that can increase tea production, I decided not to uproot tea</p> <p>“I implemented the decisions”</p> <p>“I decided to move to the rural area after retirement to practice farming”</p> <p>“I decided to go into farming seriously and my yields are now improving”</p> <p>“I felt motivated to concentrate on cash crop farming and I have improved my farm management skills”</p> <p>“I practiced intensive farming and proper land utilisation”</p>	<p><b>Started farming as a business</b></p> <p>“I stopped working and started rice farming”</p> <p>“I am benefiting as I lease more land to increase the rice acreage”</p> <p>“I felt that I had to struggle and survive as I could not continue being supported by my parents”</p>

**Appendix 151: What was happening in lives of the farmers belonging to a group at the time they decided on the enterprise(s)**

<p><b>Needed to earn a living / struggling to survive / dropped out of school / retired / jobless / low paying job</b></p> <p>“I was struggling to survive”</p> <p>“I was poor and needed money and food”</p> <p>“I had no money for inputs”</p> <p>“I used to rely on my parents to support my family”</p> <p>“I had dropped out of / finished school and needed to make money”</p> <p>“I was employed in a company but the salary was not adequate for my family's needs”</p> <p>“I was a casual labourer and needed to make money”</p> <p>“I had a job but was not earning enough”</p> <p>“I was doing casual work on somebody's farm before I decided to grow my own crops”</p> <p>“I was working but decided to stop and settle on farming”</p> <p>“I was self employed (photography and video) and needed to supplement my income”</p> <p>“I was trying small businesses such as selling clothes, hotel and tailoring which were not successful”</p> <p>“I was still young in business”</p> <p>“I got married and had many more responsibilities”</p> <p>“I got married and my salary could not meet the family needs”</p>	
<p><b>Lacked adequate skills, information and knowledge / practicing unprofitable farming</b></p> <p>“I was employed in government and was looking for something else to help me in future I was using local livestock breeds that were not productive”</p> <p>“My tomato crop had been infested with bacteria wilt”</p> <p>“I was only farming for subsistence/hand-to-mouth”</p> <p>“I was concentrating on dairy farming which was not generating much income at that time”</p> <p>“After buying the land, I was growing maize, beans and bananas before deciding on French beans”</p>	<p><b>Accessed credit</b></p> <p>“I was getting financial support (loan) from Kibirigwi Cooperative Society for coffee”</p> <p>“I had used my savings to establish a tree nursery”</p>
<p><b>Lacked adequate production resources</b></p> <p>“I lacked adequate production resources”</p>	<p><b>Relied on the market for food</b></p> <p>“I used to rely on the market for food”</p>



**Appendix 152: What was happening in the lives of farmers not belonging to a group at the time they decided on the enterprise(s)**

<p><b>Needed to earn a living / struggling to survive / dropped out of school / retired / jobless / low paying job</b></p> <p>“Life was difficult, a struggle for survival”</p> <p>“I was poor , desperate and living below poverty line”</p> <p>“I could not meet my family needs or pay school fees or carry out any development activities”</p> <p>“I was under the care of my family and provided family labour”</p> <p>“I was not able to pay school fees for my children”</p> <p>“I had no job and needed to earn a living”</p> <p>“I was an alcoholic living a pathetic life”</p> <p>“After finishing form four, I went home but my parents could not educate me beyond that level so I decided to get married and had to find means to support my family”</p> <p>“I had no money, no milk and very little income to support my family”</p> <p>“I was producing maize and beans and could not generate enough income so I added French beans and bananas”</p> <p>“I was educated, jobless and not decided on what to do with my life”</p> <p>“I had finished school but could not find employment”</p> <p>“I had just retired from employment”</p> <p>“I was a farm labourer”</p> <p>“I was self-employed as a carpenter and needed additional income”</p> <p>“I had resigned from my job”</p> <p>“I was a teacher but life was difficult”</p>	
<p><b>Lacked adequate skills, information and knowledge / practicing unprofitable farming</b></p> <p>“I was working and investing money in coffee but the enterprise did not bring any positive results”</p> <p>“Milk yields were very low and I did not have the manure that I now use on crops to improve yields”</p> <p>“I had little income”</p> <p>“Low production and no income”</p> <p>“I was managing coffee that I inherited from my father but the prices had dropped hence I needed to supplement the family income”</p> <p>“I was farming a small piece of land but at that time farming was not doing well”</p> <p>“I was not fully decided on what enterprises to produce but stood firm on starting farming”</p> <p>“I was given the shamba with tea, coffee and cows”</p> <p>“I had coffee on the farm but it was not doing well”</p> <p>“I was practicing unplanned mixed farming”</p> <p>“I was only growing maize”</p> <p>“I used to rely on the market for food”</p> <p>“I had bought land on which I hoped to settle upon retirement from the civil service and grow crops”</p> <p>“My parents used to plant maize and beans and when I went to school, I learned about cash crops, so I decided to establish coffee and tea with that knowledge”</p> <p>“I got married and found dairy, bananas, poultry, maize and beans on the farm my father gave me”</p> <p>“I was in school then I attended a course. When I returned home, I wanted to earn some income so I planted tomatoes then coffee and tea based on what I learned”</p> <p>“I was a government employee but wanted to do farming on the side”</p> <p>“I was not that good in farming and was experiencing a lot of hardships”</p> <p>“I was only producing tea”</p> <p>“I used to produce beans, potatoes and other crops and they would be destroyed by chicken”</p> <p>“I was not serious with farming and I was growing only maize and beans”</p>	
<p><b>Lacked adequate production resources</b></p> <p>“I did not have money for inputs”</p>	<p><b>Relied on the market for food</b></p> <p>“I used to rely on the market for food”</p>

**Appendix 153: Bridges that helped farmers belonging to a farmers' group to arrive at the decision on enterprise(s)**

<p><b>Visits and learning from neighbours, other farmers, friends</b></p> <p>"I attended a breeders show at Nairobi in 2004 and became interested in livestock farming"</p> <p>"I participated in the tour to Wambugu Farm and agricultural shows and learned about organic farming among other things"</p> <p>"I saw the success of some role model farmers and got motivated so I decided to grow coffee and practice dairy farming"</p> <p>"The example set by my former employee who was practicing horticulture and the high standard of living he had"</p> <p>"I learned from my employee, who was growing maize"</p> <p>"My neighbours with similar enterprises were doing well"</p> <p>"I saw my neighbours who were growing French beans and enquired about the profitability of the enterprise"</p> <p>"My neighbour was growing mangoes and was realising good returns even under low rainfall conditions"</p> <p>"I was born and brought up in this area and had seen the benefits of coffee"</p>	
<p><b>Access to information / knowledge</b></p> <p>"I attended a baraza where I learned about rearing dairy goats"</p> <p>"Information obtained in baraza on the use of organic solutions in controlling pests"</p> <p>"African Harvest equipped us with knowledge and information on tissue culture bananas"</p> <p>"Advice from agricultural extension officers, local administrators and some agricultural related NGOs"</p> <p>"The search for high yielding breeds / varieties"</p> <p>"The extension officer advised me to adopt poultry"</p> <p>"There was a ready market for French beans and tomatoes"</p> <p>"I gathered knowledge from group meetings and other farmers"</p> <p>"My farm bordered the National Irrigation Board hence I used to observe what they were doing and decided to grow rice"</p> <p>"The intervention of Christian Community Services, Ministry of Agriculture and Njaa Marufuku Project helped me arrive at these enterprises"</p>	
<p><b>Training and education institutions</b></p> <p>"Training provided by the Central Kenya Dry Area Programme"</p> <p>"I received training that equipped me with skills"</p> <p>"Had low education and no capital to invest but was trained"</p>	
<p><b>Availability of production resources</b></p> <p>"Availability of land"</p> <p>"Money from "merry-go-round" which helped to start farming"</p> <p>"A friend assisted me with a machine for pumping water for irrigation"</p> <p>"Availability of water for irrigation / water furrows"</p> <p>"The area got piped water under the central" Kenya Dry Areas Project (CKDAP)"</p> <p>"There was sufficient rain"</p>	<p><b>Own motivation</b></p> <p>"I loved farming since childhood and the lack of food and money in my household led me to arrive at this decision"</p> <p>"I wanted to engage in an activity that would keep me busy and generate income"</p> <p>"The enterprise was attracting good money"</p> <p>"The need to feed my family"</p> <p>"The need to engage in a profitable enterprise"</p> <p>"I heard that youth groups would be financed"</p> <p>"I was making losses due to fluctuating prices of tomatoes"</p>
<p><b>Support from parents</b></p> <p>"My parents engaged in similar enterprises"</p> <p>"My father gave me coffee stems to plant"</p>	<p><b>Supportive government policy</b></p> <p>"Permission by the government to grow tea in my area"</p>

## Appendix 154: Bridges that helped farmers not belonging to a group to decide on the enterprise(s)

<p><b>Visits, learning from neighbours / other farmers , friends</b></p> <p>“I saw my neighbours and other farmers with similar enterprises that were doing well”</p> <p>“I learned how profitable the enterprise rice was and learned how to grow it from other farmers”</p> <p>“I visited other poultry and fruit tree producers and had some previous farming experience”</p> <p>“I exchanged ideas with farmers belonging to a group”</p> <p>“Discussions with neighbours”</p> <p>“I learned from my father who was a coffee and tea farmer”</p> <p>“People used to come and lease my father's land to produce horticultural produce and I learned farming from my father and the farmers who leased land”</p> <p>“The farming knowledge and experience I obtained from my parents”</p> <p>“Support from my parents”</p>	<p><b>Training and education institutions</b></p> <p>“I learned about cash crops while I was in school”</p> <p>“The extension officer advised me to attend a course at KATC where I was trained on better ways of farming”</p> <p>“I attended an agricultural seminar”</p>
<p><b>Availability of resources (land, capital, irrigation water)</b></p> <p>“I had some previous farming experience”</p> <p>“I had retired from government and had bought land”</p> <p>“I had land”</p> <p>“I borrowed some money to invest in farming”</p> <p>“I had another piece of land with coffee”</p> <p>“My father gave me a piece of land with irrigation water”</p> <p>“I established myself (bought the land and planted crops) while still employed before retirement so had another source of income”</p>	<p><b>Access to agricultural information and knowledge / farmers’ experience</b></p> <p>“Agricultural information”</p> <p>“Information from emerging companies”</p> <p>“An active mind and high reasoning capacity”</p> <p>“I had some previous farming experience”</p> <p>“Advice from extension staff”</p> <p>“The Ministry of Agriculture officers explained about tea growing and pointed out that the enterprise was suitable for my area”</p>
<p><b>Own motivation</b></p> <p>“I needed milk for the family and manure to improve crop yields”</p> <p>“The desire to make the future more comfortable”</p> <p>“I wanted to diversify enterprises”</p> <p>“I used to travel far to lease land to farm but when I calculated the time taken, input costs and returns, I decided to concentrate on my own farm”</p> <p>“The feeling that the enterprises I had chosen would give me the income I needed”</p> <p>“The need to create employment and income”</p> <p>“The desire to adopt coffee, tea, dairy, maize and bananas”</p> <p>“I had an active mind and high reasoning capacity”</p> <p>“I wanted to create employment and generate income”</p>	

**Appendix 155: What farmers belonging to a group found helpful in the choice of enterprise(s) in relation to farming**

<p><b>Increased income / profits</b>          “It increased my income”          “The enterprise was earning good income”          “It helped me to feed my family and save some money to invest in other enterprises”          “My living standard was uplifted”          “I earned good income to buy inputs and for school fees”          “The enterprise has earned me ready cash to invest in the next season's crop (horticulture)”          “I have been able to educate all my children”</p>	<p><b>Improved access to information / knowledge</b>          “Agricultural information and knowledge on the selected enterprises”          “There was a ready and better market and prices”          “There was a ready market for French beans and tomatoes”          “Training and support was provided by the Ministry of Agriculture”          “Training and support from CCS, Ministry of Agriculture, Njaa Marufuku Project”          “I obtained information on improved maize seed, spacing, fertiliser application, pest and disease control”          “Knowing the best seeds, fertilisers and agro-chemicals to use”          “Information on the mango enterprise”          “Choosing the recommended variety of maize”          “I started with dairy goat farming and although I had no experience in farming I diversified to other enterprises”          “Africa Harvest provided farmers with information on growing (pruning, control of diseases) tissue culture bananas”          “We have a group that helps farmers to have one collection centre (common market)”          “Previous experience and success of my parents”</p>
<p><b>Improved farming/ increased production</b>          “It helped me to increase production”          “They made me spend less on agrochemicals”          “The enterprise helped me to improve the soil structure”</p>	<p><b>Access to production resources (land, labour, capital, water)</b>          “The dairy cow enterprise helped me to get manure”          “Poultry and dairy farming have provided manure and reduced the expenditure on fertilisers”          “The enterprise has provided me access to loans”          “The enterprise was not labour intensive”</p>

**Appendix 156: What farmers not belonging to a group found helpful in the choice of enterprise(s) in relation to farming**

<p><b><i>Increased income / profits</i></b>          “It increased production, income and profits”          “I obtained steady and regular income from French beans”          “The income I obtained allowed me to plan all farming activities including labour”          “Tea provided a monthly income”          “I was able to get some money to support other farming activities”          “The enterprises were more profitable”          “The harvest and proceeds from coffee in 1987 served as the starting capital for the other enterprises”          “The tomato enterprise helped to generate cash to pay for school fees”          “Coffee and tea were bringing good income”          “Payments I received from the coffee enterprise helped me to buy certified maize seeds”          “Other farmers growing tomatoes were fetching good money”          “The dairy enterprise assured us a regular income and good returns”          “The selection of cash crops helped to generate income”</p>	<p><b><i>Improved farming practices and increased production</i></b>          “Farm planning was easy”          “Farming has improved and production has improved”          “I am getting higher crop yields due to application of manures”          “Following training by the National Irrigation Board in Mwea, I increased the acreage of rice”          “I leased more land and I am now managing a bigger area through the experience acquired from other farmers”          “I learned how to keep proper records”          “I improved my farming activities”          “The enterprises (coffee, banana, fruits and vegetables) are performing well but there are challenges of price depression”</p>
<p><b><i>Adoption of new technologies</i></b>          “It helped me adopt new technologies practiced crop rotation / intercropping and mixed farming and production increased practiced crop rotation / intercropping and mixed farming and production increased”          “I visited other poultry and fruit tree producers and had some previous farming experience”          “I managed to buy three grade cows and started irrigation to earn money to educate my children”          “I uprooted coffee and planted passion fruit”          “The choice of diverse enterprises”</p>	<p><b><i>Improved food security</i></b>          “The desire to save some money from wages by farming instead of buying food”          “I was able to sustain and satisfy my family”          “The dairy enterprise provides milk for the family and income”          “It helped me feed my family and save some money to invest in other enterprises”          “Maize produce supplemented the other food I obtained from the market”</p>
<p><b><i>Access to resources (land, labour, capital, information and knowledge)</i></b>          “I already had a farm”          “I stopped doing casual work and concentrated on my farming activities”          “The enterprises were not labour intensive”          “I put in more effort seeking for agricultural information”          “I had the determination to get income and food for my family and I had information on the enterprises”          “This choice of enterprises gave me more experience and knowledge in farming”</p>	

## Appendix 157: What hindered farmers following the choice of agricultural enterprise(s) in relation to farming

<p><b>Market and prices</b></p> <p>“The prices for the enterprise dropped”</p> <p>“The prices for the enterprise were not good”</p> <p>“The prices of coffee are very low “</p> <p>“Sometimes markets are a problem”</p>	<p><b>Production costs</b></p> <p>“Production costs were very high”</p> <p>“The needs of coffee in terms of labour, pruning, manure, weeding and spraying are high”</p> <p>“The cost of inputs was very high”</p> <p>“The profits are sometimes very little and feeds and cost of treatment are expensive”</p> <p>“The need for pure stands of tomatoes”</p>
<p><b>Resources (capital, labour and land)</b></p> <p>“The enterprises were labour intensive / lack of sufficient labour”</p> <p>“The piece of land was small and full of cash crops and I had no place to grow food crops hence relied on the market”</p> <p>“There was no capital / lack of finances”</p> <p>“Small land size”</p> <p>“I would have wished to increase the number of cows but the size of the land was small and full of crops”</p> <p>“Capital to purchase a proper breeding stock”</p>	<p><b>Pests and diseases</b></p> <p>“Destruction of other crops by chickens”</p>

## Appendix 158: The outcomes of the choice of agricultural enterprises of farmers belonging to a group

<p><b>Positive outcomes</b></p> <p><i>Good income / profits</i></p> <p>“Good earnings to support my family</p> <p>“I obtained stable income”</p> <p>“I earned fair earnings to pay school fees and to support my family and to invest in other enterprises”</p> <p><b>Improved livelihoods</b></p> <p>“Improved standard of living”</p> <p>“I can now meet about 40% of my household's needs I improved socially and learned leadership qualities”</p> <p>“We have improved health”</p> <p><b>Food self-sufficiency / improved nutrition</b></p> <p>“Enough food for my family and surplus for sale”</p> <p><b>Improved production / yields</b></p> <p>“Increased yields and income”</p> <p><b>Improved farming practices</b></p>	<p><b>Negative outcomes</b></p> <p><i>Low production / yields / income</i></p> <p>“Production decreased”</p> <p>“The farm could then support the family but now due to subdivision to the children, income from the small farm is not adequate”</p> <p><b>Poor markets / prices</b></p> <p>“Falling prices and poor earnings”</p> <p>“Constant but not reliable source of income because of fluctuation of market prices and rising prices of farm inputs”</p> <p><b>Inadequate production resources / factors of production</b></p> <p>“Constant but not reliable source of income because of fluctuation of market prices and rising prices of farm inputs More problems and poverty”</p>
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“I obtained manure to use in other enterprises”  
 “I established 300 stems of tea”  
 “We decided to farm as a group”  
 “Production costs decreased”

**Increased knowledge, information, understanding**

“Improved varieties and increased yields from tissue culture bananas Increased satisfaction in farming”  
 “Good and ready market”

**Employment created**

“I created employment”

**Environment conserved**

“I obtained trees to plant on my farm from the group”

**Appendix 159: The outcomes of the choice of agricultural enterprises by farmers not belonging to a group**

**Positive outcomes**

***Good income / profits***

“Good profit margins / fair earnings to support my family / stable income”  
 “Income has increased”  
 “Tea provided a monthly income”  
 “I obtained good income from tea and coffee to pay for school fees”  
 “Higher production and a good and stable income”  
 “Where one enterprise failed, the others generated cash (spreading of risks)”

***Improved livelihoods***

“Food self sufficiency, clothing and education for my children”  
 “I have been able to support my family”  
 “Farming has assisted me in meeting my family obligations such as school fees and buying food that is not available at the farm”  
 “Improved standard of living  
 Children obtained educated and food needs were half met”

***Food self-sufficiency / improved nutrition***

“Food self sufficiency, clothing and education for my

**Negative outcomes**

***Low production / yields***

“Low production due to failure to use inputs”  
 “I sometimes opt not to prune or spray because of costs but this leads to a drop in yields”  
 “Low production causing poverty and theft”  
 “I am not able to manage my coffee well so the yields are low”  
 “Insufficient fodder for the dairy cattle leading to low milk yields”  
 “Low quality products / yields due to lack of inputs”  
 “I was not fully successful (low yields) because the passion fruit obtained diseased”  
 “Low yields because of adverse weather conditions”

***Low income***

“Low income from coffee caused me to venture into horticultural crops”  
 “I am not able to meet / attain all what I expected”  
 “I was able to build a house from income from coffee and bananas”

***Poor markets / prices***

“Marketing challenges, high costs of inputs /

<p>children”</p> <p>“There was more protein consumption (poultry) and sale of chickens”</p> <p>“I have been able to provide a balanced diet for my family”</p> <p><b>Increased knowledge, information / understanding</b></p> <p>“Increased knowledge / understanding”</p> <p><b>Improved production / yields</b></p> <p>“Farming has improved and I am getting higher yields / food”</p> <p>“I produced more fruit (mangoes) for household consumption and sale”</p> <p>“Higher production and a good and stable income”</p> <p><b>Improved farming practices</b></p> <p>“I have educated my children and diversified my enterprises”</p> <p>“Farming has improved and I am getting higher yields / food”</p> <p>“I produced more fruit (mangoes) for household consumption and sale”</p> <p>“I have been able to build farm structures and my house”</p> <p>“I diversified my enterprises and added vegetables, beans and maize”</p> <p>“Where one enterprise failed, the others generated cash (spreading of risks)”</p> <p>“Manure to use in other enterprises”</p>	<p>production and inadequate income”</p> <p>“The enterprises are doing well but there are challenges of price depressions, unfavourable weather and lack of funds”</p> <p>“Marketing outlets were a problem”</p> <p><b>Inadequate production resources / factors of production</b></p> <p>“Increased labour requirements”</p> <p>“There was no water for irrigation”</p>
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#### Appendix 160: Impact of decisions made by farmers’ groups on farming

<p><b>Income generated</b></p> <p>“We have improved rabbit breeds which are in high demand and fetch very good prices on the market”</p> <p>“Maize production has greatly changed and improved earnings of group members”</p> <p>“We decided to adopt bull, pigs and poultry rearing and this has earned us good income and to sustain our families”</p>	<p><b>Improved farming</b></p> <p>“Increased production - members have started growing French beans on larger areas”</p> <p>“Production of passion fruit and quality has improved”</p> <p>“Following collaboration between African Harvest and Techno Serve, we decided to grow tissue culture bananas and market them as a group through organised marketing”</p> <p>“We decided to practice professional farming and started horticulture, dairy goat and poultry farming”</p>
<p><b>Improved livelihoods</b></p> <p>“The tree nursery project has improved our ways of life, the environment and earned us income to invest in dairy farming”</p> <p>“Market French beans jointly earned us good profits and we are now getting fees for our children and have uplifted our living standards”</p>	<p><b>Provided food and improved food security</b></p> <p>“Each group member has a dairy goat and has access to milk”</p>



<b>Helped learning, knowledge and understanding</b> “The group has adopted improved farming practices and have been trained at KATC and have been able to support the needs of their families” “Members have learned better ways of managing tree seedlings” “Members have learned how to harvest honey”	<b>Soils / environment improved / fuel wood</b> “We have realised improved soil fertility through use of goat manure” “We have earned a little income but we have planted trees and get fuel wood and give out seedlings to community members to conserve the environment”
<b>Provided manure</b> “Dairy goat farming provided manure which is essential in crop (French beans, bananas, melons) production”	<b>Created employment</b> “The decision to grow French beans created employment opportunities and self employment”
<b>Negative impact</b> “There was no market for tree seedlings hence no income” “We anticipated producing grafted mango seedlings and selling to make good money but the choice of enterprise led to a big loss as the market for mango seedlings was not adequate” “We produced cut flowers but Willmar refused to buy because they had short stems and the agreement stated they would buy long stems” “The decision to adopt cotton production has negatively impacted on us as payments were delayed and production was low. Farmers have disputes with JUANCO and have written letters but have not been answered”	

#### Appendix 161: Impact of decisions made by farmers belonging to a group on farming

<b>Income generated</b> “I have earned high profits” “I have obtained milk/manure/income” “I sourced external market for tomatoes and was able to sell my produce for Ksh. 53,000 (707 USD) which enabled me to buy construction materials” “I have been able to generate more income, sufficient food and create employment” “Money from farming has helped me diversify my enterprises” “I am making stable income” “I have earned high profits” “I was able to settle on dairy goat, French beans, maize and beans enterprises that have stable income” “In 2007,I decided to plant French beans instead of tomatoes and I made returns which enabled me purchase a water pump”	<b>Improved farming</b> “The decisions helped me improve my farming practices” “Money from farming has helped me diversify my enterprises” “In 2007,I decided to plant French beans instead of tomatoes and I made returns which enabled me purchase a water pump” “They helped me improve my farming practices” “I have bought a dairy cow and have built a stone house” “I decided to try out the enterprises that were capital intensive on a small-scale”
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<b>Improved livelihoods</b> “They helped me look after my family and provided school fees, food and shelter” “I have managed to support orphaned children left behind by HIV/AIDs parents” “I managed to purchase another farm and construct a permanent house” “The decision to grow cotton as a cash crop provided me with more income that has uplifted my standard of living” “I have bought a dairy cow and have built a stone house” “They have highly lifted up my living standards and I have increased acreage of tomatoes from one acre to two acres” “I received a water tank”	<b>Provided food and improved food security</b> “I have obtained milk, manure and income” “They have helped me to produce food for my family as maize is abundant in the household” “The decision to grow maize and beans has had an average impact because rainfall is inadequate” “The decisions have helped reduce hunger, poverty and unemployment” “I have been able to generate more income, sufficient food and create employment”
<b>Helped learning, knowledge and understanding</b> “I have been able to make manure and other farmers have learned from me” “It has helped me to improve my knowledge in various fields such as feeding of dairy cattle”	<b>Created employment</b> “I have succeeded to create employment, be self-employed, earn good yields and income to support my family, build a house and establish a small business” “I have been able to generate more income, sufficient food and create employment”
<b>Provided manure</b> “I have obtained milk, manure and income”	<b>Environment conserved</b> “I have conserved the environment”
<b>Negative impact</b> “I planted tomatoes but there was no market locally” “I regret planting tea/ and coffee and wished I had opted for other enterprises which earn good money” “Income has been falling and so has our standard of living” “Economic returns have been poor” “Little or no impact because the farm inputs are very expensive” “The market is still not reliable” “The fluctuations in markets and market prices have led to my changing from one enterprise to another” “The price fluctuations of farm produce and the high costs of inputs has negatively affected farming”	

#### Appendix 162: Impact of decisions made by farmers not belonging to a group on farming

<b>Income generation</b> “The enterprises have helped me to pay school fees and meet household food needs” “The enterprises have generated good income” “I managed to buy more land from the proceeds of the enterprises” “Production / income earned has increased” “Since I introduced tea, I am able to earn income monthly to improve my standard of living” “I have educated my children and built my house with income earned from the dairy enterprise” “I started with tomatoes, then coffee then tea and these enterprises have educated my children and generated income to support other enterprises” “I have children in school and I depend on the income from French beans (constant income) to educate them”	<b>Improved farming practices</b> “Farming activities have improved but there is need for more information and credit” “The choice of enterprises made me a good farmer by learning farming as a team with my family” “I felt motivated and wanted to continue working hard until I achieve my goal” “I decided to plant tea and coffee, the management of these enterprises has improved and production has equally increased” “I was able to practice dairy farming and piggery” “I improved my farming - especially better breeds” “The dairy farming is providing manure which is being used to grow maize” “Farming has become a source of employment” “My farming activities have been progressively improving”
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<p>“I sold a calf for Ksh. 30,000 (400 USD)”</p> <p>“I have managed to take my children to a boarding school”</p> <p>“I thought I would get much more profit to uplift my family than I obtained”</p> <p>“Income from coffee helped me a lot - I started irrigation and bought three grade cattle that earned me income to educate my children”</p>	<p>“I have gained more experience in farming”</p> <p>“I have enjoyed farming and would wish to expand the acreage”</p> <p>“I diversified to dairy farming”</p> <p>“I am happy as far as farming is concerned”</p> <p>“I have developed a lot of interest in farming and I am satisfied”</p> <p>“I have improved the feeding of my chickens”</p> <p>“I have managed to develop my farm, fenced it and built farm structures”</p>
<p><b>Improved standard of living</b></p> <p>“Our standard of living has improved”</p> <p>“I decided to produce papaws, beans, maize, cassava and tomatoes and I am happy because they are helping me and others improve our livelihoods”</p> <p>“I am able to feed my family, educate my children and cater for my family”</p> <p>“My socio-economic status has improved and I have constructed a semi-permanent house”</p> <p>“I am able to stand on my own without relying on my parents”</p> <p>“I am able to address some of my needs”</p>	<p><b>Improved food security</b></p> <p>“The cow produces manure and milk”</p> <p>“I have milk for the family”</p> <p>“Poultry production has ensured a constant meat supply for the family”</p> <p>“Farming activities have improved”</p> <p>“The choice of bananas, French beans and coffee provided me with income and food”</p> <p>“I have been able to resolve most of my needs for food and money”</p> <p>“I have attained food self-sufficiency”</p>

### Appendix 163: Instances when farmers (belonging and not belonging to a group) made a major decision, solved a problem, or helped understanding because of using information

<p><b>Major decision and improved understanding</b></p> <p><i><b>Animal production</b></i></p> <p>“We decided to keep dairy goats and bought a buck and we received training from the <i>extension</i> staff. We have now registered with DGAK”</p> <p>“Following the government call to form groups to access services and learn together, we decided to adopt bee keeping, to generate income. We sought help from the <i>Ministry of Agriculture</i> (extension) and were trained at <i>Ngong Agricultural Training Centre</i> (training and education institution). We are now practicing bee keeping and make hives for sell and sell honey to generate income”</p> <p>“Our group decided that we needed to engage in a profitable and successful enterprise. We decided to adopt rabbit farming, and obtained training from <i>Ministry of Agriculture</i> (extension), then bought a good breed male rabbit to service four female rabbits”</p> <p>“When we started our group, we only had a “merry-go round.” One <i>elder</i> talked to us about bee keeping and we decided to start bee keeping and we are earning income”</p> <p>“I used information from an <i>elder</i> on the use of manure to keep out moles from the farm”</p> <p>“When we decided to introduce rabbit farming, we first underwent training at KSh.300 (4 USD) per person and were trained by <i>KIOF</i> (civil society organisation), and constructed a rabbit house. We then purchased rabbits at KSh. 350 (4.67 USD) unit cost”</p> <p>“We decided to adopt the dairy goat enterprise and invited <i>DGAK</i> (civil society organisation) and extensionists to train us. We also learned from Kituko group and we now understand and are keeping dairy goats and getting milk and goat kids for sale”</p> <p>“Using information I learned from the <i>NIB</i> (research) and <i>other farmers</i>, I decided to grow rice. As brokers were exploiting farmers, I decided not to sell my rice to them and using market information I obtained from other farmers, I sold my rice for a better price in the market”</p>
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“Our group used to support members to improve their houses and buying iron sheets but later decided to buy goats for members to ensure they had an asset”

“Our group was keeping poultry and after feeding them for a long time, they did not lay eggs. After discussing, we decided to sell them off and buy other chicks. This was apparently because the hens obtained too fat hence could not lay eggs”

“We wanted to start a group project and sat together to deliberate on what to do. We did not want an enterprise that would demand too much of our time but wanted a profitable enterprise. We shared many ideas in our group meetings and decided to keep pigs. We worked as a group and supported each other by constructing a piggery and participating in the group activities. Each member now owns about 10 pigs”

“We had no source of income so we decided to come together and form a group to be able to access the Youth Development Fund (YDF) and start fish farming and bee keeping projects to generate income. We were not successful in getting the YDF resources so we decided to contribute money and start the projects on our own”

### ***Plant production***

“One farmer heard about flower production on the *radio* and discussed it with other farmers. We decided to invite a flower buyer, who briefed us about flowers production and trained us. We then decided to form a group and have started producing flowers but have not sold yet”

“We decided to grow sunflower after obtaining information on production and seed from the *Ministry of Agriculture* (extension) and being assured of a market”

“I attended training on good coffee husbandry at *Coffee Research Station* in Ruiru, which equipped me with skills to improve coffee production. My production moved from (cherries) from 2Kg per tree to about 15Kg”

“Some members were trained at *KARI - Embu* and obtained the planting sweet potato vines and we started production”

“We were producing passion fruit as advised by an *NGO* (civil society organisation) but when the crop got diseased, we had no support / information on how to control it so we decided to abandon passion fruit and adopted commercial sweet potatoes”

“We contacted *Africa Harvest* (civil society organisation) who trained and demonstrated to us how to grow tissue culture bananas that are disease resistant and higher yielding and we adopted”

“We decided to grow tissue culture banana following encouragement from a very successful *farmers' group* which is producing tissue culture banana”

“The decision by the group to come together and start growing French beans was good. The group has been trained on how to produce French beans by a *horticultural exporting company* (private sector), how to scout for pests and diseases and we are now earning regular income”

“Our group decided to produce mushrooms and after being trained, we started farming but did not find market. We then decided to look for other people to assist us with marketing”

“I decided to apply information on a new cabbage variety (Gloria variety) that is disease resistant, has a long shelf life and is on high demand on the market and the enterprise did well, but there was a flood on the market and the prices were disappointing”

“We sat and discussed and decided to adopt TCB. We also decided to establish a nursery and sell banana seedlings to generate income for the group”

“Our group members decided to grow bananas and carry out processing and we were successful”

“Based on the market price information and planting schedule of commodities I obtained, I decided to plant French beans at a particular season instead of tomatoes and I was able to earn good profits and buy a water pump for irrigation”

“We wanted to make compost manure and after deliberating, we decided to use EM. We then used the manure to improve soil fertility”

“I decided to adopt the fast maturing eucalyptus species (instead of Grevillea) and I established a tree nursery. The trees are growing well”

### ***Tree nursery***

“The youth in our area were idle and decided to get together to compose music and sell cassettes. We later decided to start a tree nursery of indigenous and exotic tree species and sell seedlings for income generation and plant trees to conserve the environment. Our chairman approached the **Forestry officer** (extension), who gave us a site in the forest to establish our nursery and trained us”

“We made a decision to establish a tree seedlings nursery for sale. The enterprise was initially good but we lacked market in subsequent years”

“We decided to establish a tree nursery and received training on how to start a tree nursery, where to buy the polybags and how to mix the soil and we obtained income after selling the seedlings”

### **Solved a problem and helped understanding**

#### ***Animal production***

“We used to sell our milk locally or to KCC but after talking to the divisional **livestock production officer**, we learned about value addition and started the milk bar. We now sell yoghurt and “mala” (fermented milk)”

“Our group decided to adopt fish farming. When the fingerlings started dying, we consulted the **fisheries officer** who advised us to apply lime in the fish pond and this solved our problem” “The **extension officer** advised us to sell our goats and buy a pedigree buck. This enabled us to breed our goats and obtain high milk yields”

“Training from **DGAK** (civil society organisation) and livestock extension officers equipped us with skills for choosing good does hence we cannot be cheated like earlier on when we were cheated and ended up buying half improved does”

“We invited **DGAK** (civil society organisation) and the livestock extension officer to train us on tattooing. The tag number helps us to identify our goats”

“Not many people keep goats in our community so we tried to get help from the local veterinary doctor but we did not get much help. Our **group** decided to buy an improved buck to service our local goats”

“We wanted to start dairy goat farming but had no money. We decided to apply for funding from the Njaa Marufuku Kenya project and constructed housing for goats. We acquired a buck and three does and they have started kidding”

“There was unemployment so we decided to self employ ourselves and started a piggery which helped us to diversify to other enterprises such as poultry”

“When we adopted dairy goat farming, we decided to plant fodder plants such *Leucaena* and *Calliandra* to feed the goats”

#### ***Plant production***

“I attended Embu **show** and learned about drip irrigation and decided to adopt it in the vegetable garden”

“I was listening to the **radio** and heard about tissue culture banana and how they are high yielding and disease resistant and where to get seedlings. My group then visited JKUAT where we were trained and bought seedlings”

“I heard about tomato production on the **radio** and how profitable it was. I saw my neighbours crop on his farm and asked him and he explained the requirements. I bought seeds from the agrovet and with help from my neighbour I am now harvesting and selling tomatoes every three months”

“I heard about an acaricide (Triatix) on the **radio** which I tried and I found it to be superior”

“I heard about an insecticide (Polytrin from Sygenta Company) on the **radio** for controlling bollworms, thrips, and mites and tried it and it effectively controlled a wide range of pests”

“One time about three large bunches of bananas ripened around the same time. I decided to ask my **neighbour** where I could sell the bananas for a good price. My neighbour connected me to a buyer who offered a good price”

“We saw a **neighbour's** coffee that was attacked by black ants and he asked us what he should do. We decided to introduce Stinging nettle based on the local knowledge we had and the pest was controlled”

“I learned about production of flowers from a **friend's farm** and decided to grow Mobdick flowers though most neighbours were unwilling to try”

“It was once very cold and the chickens were not laying eggs. I asked my **neighbour** for advice and he told me to keep the place warm. I followed his advice and the chickens started laying eggs”

“I obtained seed from Makueni from an **elder** and its performance was better than the hybrid varieties”

“When KTDA stopped providing fertilisers and the costs of fertilisers became unaffordable, I decided to use manure in place of fertilizers”

"We decided to produce cotton after being informed that cotton farming was profitable. We were promised loans (in form of inputs) and received training from the *cotton ginnery* (private sector), *Juanco* and *Crisma* (private sector) and we produced cotton. Despite our high expectations, the yields were disappointing"

"*Syngenta* (private sector) representatives came and trained people on safe chemicals to spray on vegetables so as not to harm people's health. They also encouraged people to read labels. I then tried the safe pesticides"

"Staff from the *Cotton Ginnery* (private sector) in Mwea recommended a particular cotton seed with better performance. However, rain failure resulted in poor performance"

"*JUANCO* (private sector) used to spray our cotton for us but when the yields did not do well, many people abandoned the enterprise (mostly the younger ones). We decided to continue but decided to do our own spraying"

"Following training from *KTDA* (private sector) experts I was able to prune my tea bushes and make the farm more productive"

"We live in a drought area and most of our animals had died due to lack of feeds. An *extension* officer advised us to plant a new drought resistant variety of cotton (Hart 89 M) and we obtained a better harvest"

"The French bean crop obtained rust and some *group members* advised us to use Ocliva. We used the agrochemical and the disease was controlled"

"I heard about an insecticide (Agrinet) for controlling white flies, which was quite effective and had a longer spraying interval"

"The *extensionist* advised us to plant a particular variety of maize which we established in time and adhered to the recommendations given but failure of rain resulted in poor performance"

"I decided to adopt grafted mangoes and improved poultry farming by crossing exotic and indigenous breeds was good. I now have disease resistant mango crop and get good yields"

"When prices of fertilisers went up, I decided to make my own compost on the farm and use it on my crops"

"My coffee was producing 2 kg per shrub but when I learned about coffee nutrition and applied manure in coffee, they yields rose to 6 kg"

"I learned good agricultural practices in tomato farming and implemented the knowledge and obtained high yields and good income"

"There was a time when drought was very intense and I applied knowledge I had on moisture conservation through mulching to conserve moisture"

"We decided to use Score - a chemical for controlling rice blast and this increased rice production and the crop was healthy"

"We obtained a bumper harvest after deciding to adopt a new variety of French beans which we are still planting to date"

"The *extension* officer advised us to prune our tissue culture bananas and our production was high"

"When coffee income dropped, I earned very little income so I decided to buy a grade dairy come to produce milk that could be sold (and consumed at home) to supplement the income"

"One day, I decided to produce bananas. I visited an *agricultural officer* who introduced me to tissue culture banana and I became the first person to grow TCB in my area and I get good income"

"We used to fellowship together and decided to form a coffee group. We lacked funds for buying inputs but we were trained by the *extension* officer and were advised to apply for Coffee Development Fund and our coffee has improved"

"I planted maize which was affected by maize stalk borer. I decided to consult the *Ministry of Agriculture* staff who advised me on what chemical to use and I obtained a good harvest"

"Group members needed protein in their diet so they decided to grow Soya beans and this solved their problem"

"We went for a *study visit* and learned about top dressing with 17:17:17 which we used instead of CAN and it reduced flower abortion and increased yields"

#### ***Soil and water conservation / irrigation***

"When we wanted to conserve the soil and prevent runoff, we called the *Ministry of Agriculture* (extension) who helped us to put up the structures for conserving soil and water"

"I visited the Agricultural Society of Kenya *show* and saw bucket irrigation. I realised one does not need a large area to produce for the needs of the family. I adopted the technology and now have vegetables for the family"

### ***Tree nursery***

“The decision on starting a tree nursery solved the problem of firewood, the climate and conserving the environment in Kamunyange. The income earned from sale of seedlings has improved our livelihoods” “Members and neighbours have also been given free seedlings to plant to conserve the environment”

“When we decided on establishing a tree nursery, we received training from the district *forestry officer* (extension), who trained us on where to source poly bags, seedlings from the forest and potting of the seedlings. We now sell seedlings, earning income and planting trees to conserve the environment”

“We wanted to establish a tree nursery and conserve the environment but we had no money so we decided to contribute money to buy polythene bags and other inputs”

### ***Innovation***

“We decided to add a sticker to pesticides to make them more effective during the rainy period”

“One time, my crop was infested with flies and I did not have money to buy chemicals. I pounded tobacco leaves and neem and sprayed the mixture and the flies were repelled (own knowledge)”

“We used exhausted oil to coffee stems to control pests”

“I used cow urine as medicine to treat cow diseases”

“We used battery water treat animal diseases”

“Innovative farmers adopted the nine-seeded technology for growing maize and beans that was developed by CCS and farmers and changed it to six-seeds to suit their conditions”

Kamau (2007:154) found that in Mwea, rice farmers among an experience exchange group used rice ratoons and rice plants that were low-yielding as fodder for their cows to increase milk yields

Kamau (2007:155) found that farmers were using rice mulch on tomatoes and French beans, which helped cut down irrigation requirements by 50%

## **Appendix 164: Knowledge / information that helped farmers (belonging and not belonging to a group) make the decision(s) / solve the problem / improve understanding / innovation**

### **Extension**

#### ***Crop production***

“Knowledge that sweet potatoes are a cash / export crop and can be used for crop rotation”

“Information from the extensionists about an improved cotton seed variety and a loan from Equity bank to support seed (from the ginny) and chemicals from Juanco and Crisma and a market for the produce”

“Information about an improved variety of cotton (Hart 89 M) that was drought resistant Knowledge and information on what seed to plant, where to get seeds, how to mix the soils, how to manage the nursery and how much to sell the seedlings from the forestry officer”

Information obtained from neighbours on the use of rice straw for mulching tomatoes and French beans to reduce irrigation (Kamau 2007:155)

Information on using rice ratoons and low yielding rice plants as fodder for milking cows (Kamau 2007:155)

#### ***Animal production***

“Information on bee farming (high prices for honey), medicinal properties of honey / by products.

Information on goat farming after visiting another farmers' group / NALEP training on the hybrid buck and training from DGAK”

“Advice from the extension officer on poultry keeping, value addition and group management and support.

“Information on proper feeding of pigs from the livestock officer”

“Information from the fisheries officer on the use of lime in fish ponds in arresting the death of fingerlings”

“Information and knowledge on rabbit rearing from KIOF and Ministry of Agriculture”

“Knowledge on that we bought the wrong breed chickens and that they cannot lay eggs once they get too fat”

“Advice from the extension officer that we should contribute our own money and start fish farming and bee keeping”

“Information on the benefits of dairy goat farming, goat husbandry, making feeds using the tube technology and marketing of goat kids”

“We obtained advice from the Ministry of Agriculture on breeding rabbits and avoiding in-breeding”

“Information from the livestock officer about value addition of milk - making of yoghurt and mala<sup>99</sup>. We later invited an expert from Nairobi to train us on making yoghurt and mala”

#### ***Fertilisers and manure***

“Knowledge from an extension officer on the preparation of liquid manure”

“Information on making compost manure using EM from the extension officer”

#### ***Soil fertility and conservation / tree nursery***

“How to dig soil and water conservation terraces”

“Information about tree nursery establishment and management from the forestry officer”

#### ***Credit and microfinance***

“Awareness creation about Coffee Development Fund”

#### ***Group organisation and development***

“Advice and information on the benefits of working as a group”

“Information on group membership, recruitment and group registration procedures from the extension officer”

#### ***Private sector***

“Knowledge on production of French beans, inputs to use, chemicals to use, and marketing from horticultural exporters”

“Training on how to produce mushrooms”

#### ***Neighbours***

“We obtained information on the construction of a chicken house, laying sheets and feeding from a neighbor”

“Information from neighbours that exhausted oil protected coffee stems from pests”

#### ***Media***

“Information about flower production, pests, diseases and marketing”

#### ***Civil society organisations***

“Information from the Green-Belt Movement on conservation of the environment”

“Information and knowledge on rabbit rearing from KIOF and Ministry of Agriculture”

“Knowing the characteristics of fully improved dairy goats and using the DGAK records”

“Information on tattooing goats for identification purposes from DGAK”

#### ***Farmers' groups and group members***

“Information on how to control rust in French beans from group members”

#### ***Training and education institutions***

“Training at KATC on dry matter and milk production”

“Knowledge on the advantages of tissue culture bananas, which matures faster”

#### ***Research institutions***

“Information how to grow sweet potatoes from KARI-Embu”

“Knowledge about demand (ready market) for honey with no chemicals from ICIPE”

“Control of maize stalk borer using push - pull technology from KARI researchers”

“Information on drip irrigation”

#### ***Elders***

“Knowledge from the elders that Stinging nettle can be used as a pesticide on coffee and as a foliar feed”

“Advice from an elder in our community on bee keeping”

#### ***Farmers' own experience / experimentation***

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<sup>99</sup> Mala is a Kiswahili word for fermented milk.



“Information on local maize spacing based on our experimental experience”

“Agricultural show”

“Information on breeding goats obtained from a breeders’ show in Nairobi in 2004”

**Source not stated**

*Crop production*

“Information on sunflower husbandry and market availability”

“Information on improved maize seed variety”

“Information that the new bean variety was drought resistant so it would do well in our area”

“Knowledge that Score could be used to control rice blast”

“Growing of sweet potatoes and the availability of a market”

“Growing arrow roots using polythene sheets and manure”

“Information about a new cabbage variety (Gloria variety) that is resistant to diseases has a long shelf life and is on high demand on the market”

*Animal production*

“Information on calcium deficiency effects and the benefits of concentrates, Maclick super, DCP, cotton seed cake and multivitamins”

“Knowledge of poultry breeds that are resistant to diseases (Kenbrew) and more productive”

“Information on the nutritive value of *Leucaena leucocephala* and *Calliandra calothyrsus* and their potential in increasing dairy goat milk yields”

“Knowledge of market for rabbit skin (Germany)”

“Information on local markets for rabbit meat”

“Information on the nutritional and medicinal value of dairy goat milk and rearing and breeding of goats and their market potential”

*Agrochemicals and fertilizers*

“Knowledge on good fertilisers and pesticides”

“Information on top dressing and proper fertiliser usage”

“Information on making pesticides more effective during the rainy period by adding a sticker”

*Credit and microfinance*

“Knowledge on credit facility for improving farming”

*Agroforestry / soil fertility and conservation*

“Information on terracing, nitrogen fixing trees and soil conservation”

“The fast growing eucalyptus species take a shorter time to mature and fetch better returns on the market”

“Information on the nutritive value of *Leucaena leucocephala* and *Calliandra calothyrsus* and their potential in increasing dairy goat milk yields”

## **Appendix 165: Difficulties encountered by small-scale farmers in arriving at the decision / innovation / solution / understanding**

### **Financial resources**

High costs of inputs

Limited funds by some members to contribute towards the irrigation furrows

Challenges in paying for labour

High capital outlay to implement the group or individual decision. Where members were contributing money, some farmers could afford to but others could not raise the required sum. Some lacked money for training or for paying the service fee, hence the groups took long before moving forward

### **Information and knowledge**

Doubt in the information provided

Insufficient knowledge to inform decision and to implement

Information was not obtained when it was needed

Limited availability of service providers for advice they needed and some did not know where to find the information they needed. For example, one group remarked "We had to look for the fisheries officer who lived far away from our sub-location to come and advise us"

Not knowing where to find the agrochemicals recommended (not stocked by the local agrovets)

Not knowing where to find exhausted oil and how to apply the oil to coffee stems

Pests and diseases

Drought

### **Confusion and uncertainty**

Confusion on what other enterprise to produce because of the low returns from kale

There were many varieties and choosing the right one was a challenge

### **Group / household challenges**

Delays due to absenteeism and lateness of members

Arguments within groups, inadequate cooperation or commitment, and diverse and varying views from members.

This was particularly true for the large marketing groups where decision making took very long

Difficulties in agreeing on the enterprise to adopt. For example, some members in the banana wine group opposed the decision to make wine and argued that making wine was anti-Christian

Disagreement with spouse who did not agree on the recommended spacing and argued that the wide spacing wasted space that could have been used to produce more

### **Markets**

Market exploitation by intermediaries

## Appendix 166: Views from farmers belonging to a group on differences between individual and group decision making

Individual decision making	Group decision making
Individual decision making is faster and easier to arrive at and requires little or no consultation	Group decision making takes much time and requires many meetings to incorporate different views, levels of thinking, interests, commitments and must have consensus
Individual decision making is based on what only one person feels, knows, thinks, preferences and resources	Group decision making is wider and richer (includes collective discussion, resources and knowledge assets. It is exhaustive, reliable and detailed with input from the majority of members
Individual decision making focuses on personal interests with input from spouse and children	Group decision making is based on the interests of the entire group and is based on collective views
Individual decision making is flexible	Group decision making is more rigid and is guided by the majority consensus
There are higher chances of failure in individual decision making, because it may sometimes be wrong since there is no one to evaluate alternative options	Group decision making is based on multiple views and evaluates many possible options hence decisions have a higher probability of success
Individual decision making is easier as there are no debates	More hard work goes into group decision making in terms of discussion and debates
There are no conflicts with individual decision making	Sometimes conflicts among members lead to opposing views and some members may not agree or choose to be uncooperative
There is more risk taking in individual decision making compared to group decision making	Group decisions tend to be less averse to taking risk than individual decisions because many options are evaluated before a decision is taken
Individual decision making may sometimes be shallow (one view point) as one individual does not know everything	Group decision making is richer and is informed by many view points that are extensively debated before a decision is agreed upon

**Appendix 167: Views from farmers belonging to a group on reasons for the preference of individual / group decision making**

<p><b>Individual decision making</b></p> <p>Only entails research by an individual or with his / her family. The decision is based on what the individual knows feels and capability. There are no arguments and no external forces</p> <p>Decision making is simpler, faster, easier and more flexible</p> <p>Individual decision making is not stressful and is not forceful</p>	<p><b>Group decision making</b></p> <p>It is richer, exhaustive (collection of many complementary ideas, views), well researched and analysed</p> <p>It is slower but more reliable and grounded on facts</p> <p>It is inclusive and enlightens and empowers all members (slow and fast thinkers)</p> <p>It addresses a shared objective of the group that suits the majority of members</p> <p>It does not blame anyone (executive or other members)</p> <p>Group decision making is shared and helps members to know what they do not know. The decision is owned by the group</p> <p>Group decision making ensures mutual unity, support and cohesiveness and we believe “umoja ni nguvu” (Kiswahili for unity is strength)</p>
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**Appendix 168: Suggestions from farmers belonging to a group on improving decision making, innovation, problem solving, understanding**

<p><b>Information and knowledge</b></p> <p>Have more frequent training, seminars, demonstrations to increase agricultural knowledge</p> <p>Have more information from different sources (local and external) at the local level to enable one to evaluate options and decide</p> <p>Facilitate farmers to attend more tours and visits (visit model farmers)</p> <p>Provide farmers with comprehensive information - from production to markets and prices</p> <p>Employ more agricultural extension staff</p> <p><b>Group formation</b></p> <p>Form groups to make it easier to access information to facilitate decision making / problem solving / innovation and increase understanding</p> <p>Strengthen the capacity of groups in group management and conflict management</p> <p><b>Marketing</b></p> <p>Improve the marketing of farmers’ produce by reducing the marketing chain (eliminate intermediaries)</p> <p><b>Improved linkages / communication</b></p> <p>There is need for collaboration between extension, research and farmers to carry out research on existing local knowledge and make available more local knowledge to farmers</p> <p>Carry our trials on new enterprises before releasing them to farmers to avoid the problem of unknown diseases e.g. the passion fruit disease problem</p> <p>Improve communication between farmers and information providers</p>
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**Appendix 169: Suggestions on improving individual and group decision making from farmers belonging to a group**

<b>What needs to be done to improve individual decision making / innovation / problem solving / understanding</b>	<b>What needs to be done to improve group decision making / innovation / problem solving / understanding</b>
Provide more training, reliable knowledge and information to guide research that guides decision / solution / innovation / understanding	Provide more training and education, reliable information and knowledge from experts to inform decision / innovation / problems solving / understanding
	Provide training in leadership, organisation development and conflict management in groups
Avail farmers of more information resources and improve access to information	Improve on group dynamics, communication and ownership of decision
Have a clear vision, goal and objectives	Members should have a common achievable and shared vision, goal objectives and needs
Discuss issues with family before arriving at a decision	Group members should be the same age
Avail farmers of more information providers e.g. extension officers to advice farmers	Improve participation and understanding of each all members and allow those more knowledgeable to enlighten members
Encourage individuals to join a group	Inculcate trust among group members
Individuals should be encouraged not to be too hasty in adopting new enterprises without have an assured market	Follow and obey the group's constitution
	Use the local language to ensure all members “are together”

## Appendix 170: Needs and wants of farmers for information and knowledge in the community

N=83 for farmers belonging to a group, N=54 for farmers not belonging to a group

	Farmers belonging to a group		Farmers not belonging to a group	
	N	%	N	%
Provide more training, information and knowledge (external and local) / learning opportunities, demonstrations, field days, exchange visits	27	23.1	13	18.3
Improve access to knowledge / information / technologies (indigenous / external)	13	11.1	5	7.0
Increase the number of extension officers	13	11.1	14	19.7
Ensure extension messages / information and knowledge reach all farmers	9	7.7	5	7.0
Provide financial support / affordable credit facilities for farmers	7	6.0	2	2.8
Provide water for irrigation	6	5.1		
Ensure all farmers practice modern farming / good agricultural practices	6	5.1	4	5.6
Establish a resource centre with audio visuals	5	4.3		
Link production to value addition and marketing	5	4.3		
Find better markets for farmers produce	4	3.4	5	7.0
Invite extensionists to barazas	3	2.6	1	1.4
Subsidise farm inputs	3	2.6	4	5.6
Create more awareness of available information	2	1.7		
Provide assistance to capture, process and share local knowledge	2	1.7	1	1.4
Produce farmer information materials	1	0.9		
Increase the number of farmer training centres	1	0.9	2	2.8
Become a role model for others to learn from	1	0.9		
Have standardised information	1	0.9		
Improve coordination and ensure participation of all actors (government, research, training, private sector etc.) hold joint field days / demonstrations	1	0.9	2	2.8
Organise farmers into groups and prepare a training programme and forums for sharing information	1	0.9	1	1.4
Have monthly seminars / training on entrepreneurship	1	0.9		
Provide market information	1	0.9	1	1.4
Provide access to ICTs to all farmers	1	0.9	1	1.4
Encourage the community to focus on external information and knowledge and not local knowledge	1	0.9	2	2.8
Hold demonstrations in each sub-location	1	0.9		
Provide access to service providers	1	0.9		
Find money to support training / demonstrations			1	1.4
Provide support in value addition			1	1.4
Advise farmers on what enterprises to adopt			2	2.8
Provide FEOs with transport			1	1.4
Have sustainability strategies for initiatives led by NGOs			1	1.4
Visit farmers at their farms			1	1.4
Decentralise extension			1	1.4
Total	117	100	71	100

## **Appendix 171: Barriers / constraints encountered by individual farmers (belonging and not belonging to a group)**

### **Availability of information providers**

Limited availability of information providers.  
Inadequate skills and opportunities to learn.

### **Access to and quality of information**

Information (production, market and price information) provided was not adequate or comprehensive / (e.g. information on new technologies).  
High cost of information services (e.g. veterinary services and training by private experts).  
Some information providers lacked proper understanding hence could not explain properly.  
Information was not received in a timely manner e.g. in some cases farmers had to wait for long before obtaining service from information providers.  
Some of the information shared was wrong or not accurate leading to mistrust of some information providers.  
Some farmers stated that they did not know where to find information.  
Confusion due to contradictory information from different sources (e.g. agrochemical companies, stockists and brokers).

### **Inadequate resources / interest rates**

Inadequate financial resources to pay for training, study tours, transport, information services and to acquire inputs, hence could not implement the skills or information acquired.  
High interest rates charged on agricultural loans taken by farmers.

### **Personal and social barriers / culture**

Ignorance, apathy, discouragement or indifference by some members, hence some did not access or share information.  
Poor cooperation among actors leading to duplication of efforts and gaps in information provision.  
Mistrust of information.  
Jealousness leading to hoarding of information or mis-information because information was seen as a key to success and some did not want others to achieve what they had attained. Some feared competition from other farmers or wanted to guard the market niche they had found.  
Limited time because of the many chores farmers have to carry out.  
Reluctance to share information by some farmers (poor sharing culture).  
Lateness and absenteeism at meetings leading to delays in accessing and implementing information or skills acquired.  
Some farmers did not attend barazas where information was shared.  
Disagreements among leaders or among group members, which affected the progress of the group.  
Difficulties in convincing spouses about adoption of new enterprises.  
Some people are negative to change.  
Some farmers believed they knew it all and were reluctant to change to modern farming.

### **Communication**

Communication barriers in terms of language used, technical language used and distance to the sources of information.  
For example some farmers perceived the language used by researchers and on manufacturers labels and leaflets to be too technical.  
Communication breakdown between farmers and information providers for example between farmers and horticultural exporters leading to poor flow of information and poor relationship.  
Training provided is theoretical and lacks practical sessions or demonstrations.  
Resistance to change by some farmers, who opposed new ideas suggested by group members.  
Low value attached to the information shared. Some looked down on the information provided.  
The absence of a common forum for sharing information.  
Long distances to the sources of information.

### **Education level**

Low education levels, for example some farmers explained that they could not read instructions on labels of agrochemical and other inputs.

## Appendix 172: Barriers / constraints experienced in working with actors and strategies used for overcoming them

Actor	Barrier / constraint	Overcoming barrier / constraint	Outcome
General	Lack of / poor cooperation and coordination between actors	Established stakeholder forum / platform Improve communication through mobile phones and e-mail	Partnerships forged and some actors sharing information Improved collaboration and performance
	Most actors link directly to farmers then there is no follow up The interests of different actors take precedent and further weaken existing linkages leading to competition and conflict Poor time management by some actors Inadequate financial resources (transport, logistics, inadequate staff) to facilitate collaborative activities	Held stakeholder members information day to plan and develop action plan jointly  Plan and act timely Work through NALEP – stakeholder activities e.g. joint field days Sought support from development partners	Some joint activities (field days, exhibitions, field days) Actors were encouraged and became more active  --- Very successful but a few problems.  Some donors were not willing to fund stakeholder strengthening activities Interest of farmers gained.
	Lack of policy that formalises linkages with guidelines for operationalising activities	Stakeholder forum	
Cooperatives / societies / coffee factories	Late payment for produce delivered	Explore alternative markets	Selling coffee on open market
KUSSTO	Only deals with small-holder tea farmers Promise what they cannot deliver	De-link KUSSTO from KTDA	No change
KENFAP	High registration fee	Group members contributing money	In the process of mobilising funds
Farmers' groups	Many are established but soon disintegrate due to high expectations and lack of vision	Training by Ministry of Social Services	Group governance established and constitution developed to guide members
Government ministries	Weak linkages – usually one-way vertical flow from a ministry but not cross-cutting across ministries	Called meeting of stakeholders e.g. the case of Njaa Marufuku Kenya project	Technical and logistics input from other actors helped group formation and development



Extension	Not always readily available (very few)  Do not have adequate resources e.g. for demonstrations	Call and book appointment / visit the office, and complain and ask for more staff Farmers have to provide the required resources	Extensionists visiting groups by appointment
Research institutions	Weak linkages with extension and farmers  Inadequate adaptive / on-farm research	Held extension-research meetings Work with ATIRI  Held stakeholder workshops	Feedback from meetings passed on to policy makers Technologies developed passed on to farmers  Synergy established, joint-learning, planning and sharing of experiences
Education institutions	Weak linkages with farmers and other actors Linkage mechanisms not formal leading to problems of guarding one's territory Inadequate resources to support linkage activities Very few and irregular and only select a few groups or farmers to work with	A few outreach activities but limited by available resources Performance contracts and outreach activities Visit them at their institutions	Excellent response and few farmers trained and satisfied Community service models in place  Sometimes the contact persons are not found at their institutions which are far and it is expensive to travel
Training institutions (KATC)	Poor infrastructure (ICT and road) leading to isolation	CDF informed about poor road infrastructure, acquired wireless connectivity for phone and internet	Can communicate by phone and e-mail and can access internet
NGOs	Very few and do not cover some divisions. Seem to favour Mwea and Ndia Not regular and disappear without notice when their project ends	---  Called upon the Ministry of Agriculture to step in	---  The passion fruit crop introduced to farmers by Drumnet was destroyed by an unknown disease and the project was abandoned
Stockists	A few are knowledgeable and explain about the inputs required to farmers but most cannot explain and ask farmers and tell them to read labels	Some farmers are illiterate and cannot read hence visit stockists that are knowledgeable and can explain and avoid those who just want to sell.	Information was provided before purchase and the end result was positive
International organisations	Limited funds to pay for training	Seek support from development partner to pay facilitator	Trained on safe use and handling of pesticides
Development partners	Weak linkages between actors	IFAD project linked extension, KACE	Joint activities and information on major crops, major markets and prices received but middlemen benefitted more than farmers

## **Appendix 173: Overcoming barriers or constraints encountered in accessing and sharing information**

### **Capacity building and strengthening**

Increase the number of service providers  
Strengthen institutions providing information and improve linkages between actors  
Equipping information service providers with adequate skills by training them

### **Improve access to training and information**

Establish a local information centre  
Provide more agricultural training, education or seminars on new technologies and improved farming methods  
Increase the number of service providers such as extension workers  
Hold regular barazas  
Provide relevant agricultural content in appropriate formats and language  
Increase the agricultural activities carried out by NGOs  
Community members should be proactive in seeking for information and knowledge e.g. attending field days open days  
Provide print materials that are appropriate for farmers  
Introduce more agricultural programmes on radio  
Establish demonstration plots  
Provide accurate information from research and extension

### **Improve communication**

Facilitate extension staff (with transport) to visit farmers  
Improve communication and enhance cooperation between information providers / actors  
Reduce communication costs  
Create awareness of existing information and knowledge on new technologies and improved farming methods

### **Improve the management of groups**

Enforce rules that ensure farmers attend meetings and on time

### **Improve access to markets and prices**

Improve markets for farmers' produce and prices  
Address the problem of prices and valid contracts between farmers and horticultural exporters  
Provide market information to farmers in appropriate language and formats

### **Targeting of information**

Carry out research on farmers' fields to address farmers' problems  
Information provided should be relevant to the needs of farmers in Kirinyaga

### **Provide access to credit**

Facilitate access to funds or credit  
Provide loans to farmers at lower interest rates  
Provide farmers with agricultural inputs on credit to be paid but after harvest

### **Subsidies on inputs**

Subsidise / reduce the cost of agricultural inputs

### **Facilitate adult literacy**

Farmers who can read should help those who cannot read and write  
Encourage farmers who cannot read and write to attend adult literacy classes

#### **Appendix 174: Barriers or constraints encountered by farmers' groups in accessing and sharing local knowledge**

##### **Sources and quality of knowledge**

There are few sources of knowledge  
Experts with the knowledge are some times not available  
Low awareness on where to find local knowledge  
Inadequate knowledge on value addition and agroprocessing.  
The knowledge needed is not timely

##### **Personal and social barriers and culture**

Low literacy levels  
Ignorance on the part of some group members  
Age differences between members  
Arguments among members, leading to delays in decision making  
Doubt and mistrust of local knowledge  
Alteration of knowledge  
Members are at different levels of understanding

##### **Preservation**

The knowledge is not recorded or documented

##### **Communication**

Poor communication infrastructure  
Transport challenges

#### **Appendix 175: Barriers or constraints encountered by farmers belonging to a group in accessing and sharing local knowledge**

##### **Sources and quality of knowledge**

There are few people with local knowledge as most of the elderly people with this knowledge have died  
Inadequate local materials to use due to loss of biodiversity  
People have limited information hence cannot be able to explain to others

##### **Personal and social barriers and culture**

Some people have negative attitudes and look down on local knowledge  
Others are ignorant and rigid  
There are few people with local knowledge as most of the elderly people with this knowledge have died  
Some people have knowledge but do not like to share with others and such knowledge is slowly fading away  
Arguments among group members and lack of cooperation  
Low interest among the younger generation in learning from the older people Lack of interest among the younger generation in learning from the older people  
Limited time to attend demonstrations and seminars on indigenous materials  
Illiteracy

##### **Efficacy and cost**

Extremely low financial resources to acquire indigenous materials  
The knowledge shared is not always effective

##### **Communication**

It is difficult to reach the farmers with local knowledge

## Appendix 176: Barriers or constraints encountered by farmers not belonging to a group in sharing local knowledge

### Sources and quality of knowledge

Very low awareness of where to get indigenous materials used in farming  
There was inadequate local knowledge because it was not documented and was slowly fading away as the elders died  
Some of the information passed down was not clear

### Personal and social barriers and culture

Some people had negative attitudes or looked down on local knowledge  
Some people did not want to share what they knew  
Some did not trust that the knowledge  
Some people looked down on the information  
Others were rigid and wanted to adhere to modern farming  
Some people were ignorant and indifferent

### Efficacy and cost

Some of the local knowledge passed down had side effects or did not work  
Some perceived that local knowledge took long to yield results

## Appendix 177: Some narrations on how farmers' groups collected agricultural information

### Writing minutes

"The chairperson and secretary attended a baraza and captured information about a new rice disease and made notes in the minutes / records book. He later shared the information with group members during a group meeting"

"The group's chairperson was trained on goat management and marketing of kids at Wambugu Farmers Training Centre, where he recorded all that he was taught in the group's records book. He then used the notes he wrote to train group members"

"We learned how to make fireless cookers from extension officers. The secretary wrote down all the steps of making the baskets. Members who did not attend the training referred to the minutes and also learned from those who attended the training"

"Following training by KIOF on rabbit rearing, we built a rabbit house and bought some rabbits. The patron made notes of all the steps and recorded the plants that were required for feeding rabbits in the records book. Individual members also made notes in their books"

The group wrote notes following a meeting with an agronomist from KHE on the use of chemicals and spraying. The secretary also recorded the types of chemicals and instructions on quantities to use and how to apply for future reference

"The livestock officer came and trained us on bee farming, planting flowering trees, colony maintenance and division. We made personal notes and the

### Writing personal notes

"When our French beans were affected by a certain disease, we invited Nicola (horticultural exporting company) and they explained to us what to do. Individuals took notes for future reference and to be able to explain to others clearly"

"We attended a DGAK and livestock extension officers training on dairy goat husbandry and captured information from experts by writing our own / group notes"

"Some members attended a training course on organic farming at KIOF (NGO) and made notes. They then used their notes and knowledge stored in their heads to train other group members when they returned"

"The chairperson collected information on zero grazing units from a model farmer in Ndia division and the secretary made notes. They then briefed the group about what they saw"

"Selected members went for training on TCB and wrote notes and when they came back, we organised a meeting for him to train the other members"

"Our group visited KARI-Embu and learned about sweet potato nursery. Individual members recorded the details in their notebooks, while the secretary recorded the main points for the group's official file"

"When we attended training in Ngong Agricultural Training Centre on bee keeping and individual members and the secretary wrote notes on what we

<p>secretary wrote notes for the group's file"</p> <p><b>In people's heads</b>          "We adopted TCB and mushrooms and during training, we listened, wrote notes in our notebooks but also stored the information in our heads"</p>	<p>learned. The group's notes were used to brief other group members that did not attend. The group patron also carried the flip chart sheets used by the instructor for future reference by group members"</p>
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## Appendix 178: Examples on capturing of local agricultural knowledge by farmers' groups

<p><b>Writing notes / minutes</b>          "The chairperson and secretary attended a baraza and captured important agricultural knowledge by taking notes in the minutes book then shared the information to members during the group meeting"</p> <p>"One group members learned how to treat bloat in cows from a neighbour using Tithonia (<i>Tithonia diversifolia</i>), Mexican marigold (<i>Tagetes minuta</i>) and tobacco. He captured the knowledge in his head and made personal notes. He also shared the knowledge with other group members during our meeting and the secretary captured the details in the minutes"</p> <p><b>In people's heads</b>          "We captured information on the use of Neem in treating livestock diseases through word of mouth from elders and stored it in our heads. Some members wrote notes in their notebooks"</p> <p>"We gathered information on medicinal plants that control plant pests, round worms and liver flukes from elders that communicated the information orally to us. We captured the knowledge in our heads and made personal notes"</p> <p>"We obtained information from elders on the use of ashes in the nursery bed and in seed dressing to control soil borne diseases and captured it in our heads"</p> <p><b>Photographs</b>          "We took photographs of some of our indigenous plants and made a publication"</p>	<p><b>Demonstrations and samples</b>          "We captured information on how to control poultry disease (Newcastle disease) using Aloe vera and using Neem to control East Coast Fever in cattle through word of mouth from elders and by observing other community members. Some members demonstrated how to prepare the concoction during a group meeting"</p> <p>"We gathered information on medicinal plants that control plant pests, round worms and liver flukes from elders that shared the information orally to us and showed them to other group members. Some members took the samples and planted them on their farms"</p> <p>"Our group was feeding goats using indigenous shrubs and the goats performed very well in terms of milk yields. We demonstrate the practice to other community members who adopted the practice"</p> <p>"We learned about traditional bee keeping orally from elders who demonstrated traditional bee farming practices to us in the forest. The secretary also took minutes of the proceedings"</p> <p>A group member used "Kaburura" - a local medicinal plant to treat digestion disorders and diarrhoea in goats. He shared the information with other group members and demonstrated how it worked at his farm</p>
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