UNIVERSITY OF KWAZULU-NATAL

THE TRANSFER OF TECHNOLOGY TO THE RURAL POOR: THE CASE OF QAMATA IRRIGATION SCHEME IN THE EASTERN CAPE PROVINCE OF SOUTH AFRICA

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2009

DECLARATION

I, COLLINS KODUA-AGYEKUM, solemnly declare that this thesis is not someone else's work. It is the result of my effort through the guidance of the recognized supervisor, Professor Ralph Lawrence.

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The Transfer of Technology to the Rural Poor: the case of Qamata Irrigation Scheme in the Eastern Cape Province of South Africa

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ABSTRACT

Poverty, unemployment, inequality and food insecurity are common facts of life in rural communities in the former homelands of the Eastern Cape Province of South Africa despite decades of massive infusion of irrigation technology and resources into the rural economies. These problems are mostly the corollary of public policies enacted and executed over the years under colonial and apartheid regimes. Even the establishment of developmental local government and the introduction of various forms of integrated and sustainable rural development policies and programmes under the current democratic political dispensation, which began in 1994, have not brought much relief to the rural areas. Development policies and programmes have not been successful at increasing the coping strategies of the majority of the rural poor as they continue to remain outside the mainstream of development action.

The persistence of socio-economic problems elicits questions regarding the appropriateness of development policies with respect to the transfer of irrigation technology to the rural poor. This study critically investigates the social and economic effects of Qamata Irrigation Scheme (QIS) on the living conditions and coping strategies of the farmers at Qamata. The outcome of the investigation is used as the context to analyse the effectiveness and appropriateness of the irrigation development and management policies in the transfer of irrigation technology to the farmers. The choice of QIS was occasioned by its position as the first state financed large-scale irrigation scheme in the late 1960s in the former Transkei which was the poorest and most populous Bantustan; Qamata was one of the poorest rural communities in the territory. Besides, QIS is one of the largest irrigation schemes in the Eastern Cape which has attracted a considerable amount of resources and public attention. It was therefore thought that the study of QIS could generate the relevant data required to evaluate the appropriateness of irrigation schemes in rural development in the province.

The roles and expectations of development functionaries with reference to development policies, programmes, practices and achievements, and the living conditions, needs, aspirations and perceptions of beneficiaries were critically examined. Because rural development is a multi-faceted concept, the approach of the study was eclectic. The data which ensued was analyzed both qualitatively and quantitatively with chi-square test and independent samples t-test to arrive at forthright and compelling conclusions.

The study revealed that rural development at Qamata is fraught with political, institutional and organizational problems. As a result, the Qamata Irrigation Scheme could not bring about the expected socio-economic development in the surrounding rural communities. Suggestions are offered on the basis of the research findings for meaningful rural development. The participation of local communities, especially women who bear the brunt of rural poverty and food crop production, in development policy formulation and the participation of the youth in irrigation farming are seen as essential prerequisites for goal oriented rural and agricultural development intervention programmes.

PREFACE

The transfer of irrigation technology to rural communities to address the problems of widespread poverty, unemployment and food insecurity in the former homelands of South Africa was recommended in 1955 by the Tomlinson Commission. Following the publication of the Commission's report in 1955, many state sponsored large-scale irrigation schemes were established in the former territories of Transkei and Ciskei, the two ex-homelands in the Eastern Cape in the 1960s and 1970s, as an integral part of the rural and agricultural development process. To date, the entire rural and agricultural development process has had no significant impact on the living conditions and livelihood options of the majority of the rural people.

There is an obvious need for the transfer of irrigation technology to the former homelands of Eastern Cape as moisture deficits hamper the development of sustained crop production resulting in widespread poverty and unemployment. However, the provision of irrigation systems and institutional support and services did not dovetail effectively with the life-worlds of the poor rural farmers. The situation is blamed on the manner in which the development policies were crafted and the delegation of important development activities to technical experts and consultants. Evidently, development planners were led into providing inappropriate infrastructure and institutional support and services because the intended beneficiaries were not encouraged to participate in decision-making. The irrigation intervention programme was thus confronted with the problems of defining development objectives precisely, paucity of appropriate data, lack of understanding of local conditions and inadequate administrative and managerial capacity.

The lessons learnt from the attempt at rural and agricultural development via irrigation development programmes in the former Bantustans in the Eastern Cape are essential for the formulation of future social and economic development policies. The contention of this study is that rural development policies should be adapted and reoriented to cope effectively with the uncertainties and complexities of the development process.

The fieldwork was carried out in the Qamata area in the former Transkei between November 1999 and December 2005 and between May 2007 and April 2008. A wide range of research techniques and methods of data analysis was employed to investigate the social and economic impact of irrigation technology in the rural economy of Qamata. The study was supervised by Professor Ralph Lawrence, who directs the postgraduate programme in Policy and Development Studies at the University of KwaZulu-Natal, Pietermaritzburg. However, the entire thesis is my own work, and has not been submitted in part or in whole to any other university.

The duration of the study clearly depicts how difficult it is to undertake a study of this magnitude in an insolated and disadvantaged community such as Qamata. For example, official documents such as production data, distribution of irrigated plots, maps, aerial photographs and correspondence could be secured only after persistent telephone calls and numerous visits. The difficulties encountered are a reflection of the problems which the development process in the former homelands of Eastern Cape has to cope with.

C. Kodua-Agyekum
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Many people have assisted me in diverse ways in finalizing this doctoral thesis. Certainly, the names of all the people involved cannot be mentioned in these few pages. Even so, I would like to name some individuals and groups who have been exceptionally important to my study.

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Finally, I am deeply indebted to my wife, Felicia, my daughter, Augusta and my two sons, Kwaku and Papa Yaw for their support and understanding without which this study would not have been completed.

ACRONYMS AND ABBREVIATIONS

ACESS	Alliance for Children's Entitlement to Social Security
ANC	African National Congress
ARC	Agricultural Research Council
ARDRI	Agricultural and Rural Development Research Institute
COSATU	Congress of South Africa Trade Unions
CSIR	Council for Scientific and Industrial Research
DFID	Department for International Development
ECATU	Eastern Cape Appropriate Technology Unit
ECDC	Eastern Cape Development Corporation
ESKOM	Electricity Supply Commission
FAO	Food and Agriculture Organisation
GDP	Gross Domestic Product
GEAR	Growth, Employment and Redistribution
GNP	Gross National Product
IDP	Integrated Development Planning
IDT	Independent Development Trust
IFAD	International Fund for Agricultural Development
IMT	Irrigation Management Transfer
IPTRID	International Programme for Technology and Research in Irrigation and Drainage
ISRDS	Integrated Sustainable Rural Development Strategy
IWMI	International Water Management Institute
LEIT	Low external input technology
MDGs	Millennium Development Goals
NALEDI	National Labour and Economic Development Institute
NEC	National Executive Committee
NGOs	Non-governmental organisations
PDL	Poverty datum line
PIM	Participatory Irrigation Management
RDF	Rural Development Framework
RDI	Rural Development Initiative
RDP	Reconstruction and Development Programme
RDS	Rural Development Strategy
SACP	South African Communist Party
SPSS	Statistical Program for Social Sciences
TCOE	Trust for Community Outreach and Education

TRACOR	Transkei Agricultural Corporation
ULIMOCOR	Ciskei Agricultural Corporation
UNDP	United Nations Development Programme
UNRISD	United Nations Research Institute for Social Development
WUA	Water Users' Association

DEDICATION

In view of the enormous contribution and sacrifice of my wife, Felicia, towards the completion of the study, I gladly dedicate this thesis to her.

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CHAPTER 1

INTRODUCTION

1.1 Background to the problem

Although South Africa is ranked as an upper-middle-income country (Machethe, 2004:1; Carter and May, 1999:1) the rural economies across much of the country are in crisis owing to chronic mass poverty and deprivation. 'Crisis' is one of the most overused words in South African development lexicon (Shezi, Everatt, and Jennings, 2003:110); however, its application seems appropriate when discussing the political economy of the rural areas[1] because of the hardships (poverty, food insecurity, unemployment, poor infrastructure, etc.) the majority of the rural dwellers have to endure (Kirsten and Moldenhauer, 2004:2). The current upheaval in the countryside is consequential to the effects of recurrent droughts accentuated by ill-conceived development policies (DFID, 2002:10).

Droughts have a profound impact on rural livelihood options and strategies in South Africa because as much as 31,4% of the population of the country lives in rural areas of the former homelands[2] created under apartheid; the rural households either depend directly on agriculture and allied activities for their survival and income generation, or depend mostly on farming activities to supplement other sources of income (Statistics South Africa, 1999:1)[3]. In the case of the former homelands in the Eastern Cape Province, the proportion of the population which depends on agriculture and allied activities is as high as 91,6% (Statistics South Africa, 1999:20). Owing to insufficient rainfall [4]

[1] Areas in the countryside outside the jurisdiction of a town or city. In the former homelands, the rural areas were administered by tribal authorities.

[2] The 'homelands' were geographical entities in South Africa before 1994 reserved for the blacks. The black population was assigned to a homeland according to ethnic or linguistic group. The Bantu Homelands Constitution Act (1971) established them as Self-Governing Areas. Four of the homelands, viz, Transkei, Bophuthatswana, Venda and Ciskei were eventually granted 'independence'. The Transkei and Ciskei were reserved for the Xhosa speaking blacks. The inhabitants of the 'independent' homelands lost their South African citizenship and became citizens of the 'new countries' (A Dictionary of World History, 2000).

[3] Statistics South Africa's (1999) Rural Survey is the most recent and comprehensive official data available on South Africa's rural economy.

[4] Discriminatory policies and traditional practices which limit the access of sections of the population (e.g. females) to productive resources also account for the widespread nature of subsistence farming in the former homelands of the Eastern Cape (see Chapter 3 and Section 6.2.1 of Chapter 6).

subsistence farming is widespread: according to Statistics South Africa (1999:1), 93% of the rural households in the former homelands are engaged in subsistence farming. Widespread subsistence farming accounts for the generally very low agricultural productivity in the ex-homelands (FAO, 2007:4). Indeed, low agricultural productivity largely accounts for the widespread nature of poverty, food insecurity and desperation in the rural areas of the Eastern Cape Province (Khanya, 1999:6). The link between subsistence farming and rural poverty at Qamata will be discussed in Section[5] 7.2 of Chapter 7 of this study.

The uncertainties that characterise rural livelihoods in the former homelands prompt two fundamental questions: firstly, why do problems of food insecurity and abysmal poverty still persist in spite of the numerous irrigation intervention programmes and projects that have been established over the years to improve rural livelihood options and strategies? One of the major concerns of rural and agricultural development intervention policies and projects is how to increase agricultural production (Wolfensohn, 2003:v-vi). The question therefore relates to the inherent weaknesses of development policies, programmes and projects (it will be discussed in Chapter 8). Rural intervention projects did not establish bases (e.g. the transfer of appropriate technology and skills acquisition) for sustained economic growth and social development in the former homelands. And secondly, is it by accident or design that in the national spatial system the areas where rural poverty has a firm grip on livelihood options occur in the former homelands? This question addresses the spatial and policy aspects of poverty. As it will be discussed in Chapter 3, in certain locations the majority of the people is poor and has limited prospects of escaping poverty. The people experience common vulnerabilities based on a common place of abode (de Beer, 2000a:2).

Turner and Hulme (1997:1) and Smith (1985:129-144) blame the occurrence of inappropriate development policies and strategies on the poor performance of public sector organizations. They contend that these organizations,

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[5] The term ‘section’ is used throughout this study to indicate either a part of the thesis or a part of the Qamata Irrigation Scheme (QIS). A short description is offered in each case to obviate any confusion. Where a combination of numbers and dot(s) is used (e.g. Section 7.2 of Chapter 7), it indicates a part of the thesis. Where a number between 1 and 6 is used (e.g. Section 1 of QIS), it indicates a reference to a part of QIS.

especially in the Third World, have failed to provide political leaders with sound advice on policy; in addition the public sector organizations have assumed inappropriate functions and duties and have been both inefficient and corrupt. What one gleans from these observations is that the quality of public policy is a function of the performance of public sector organisations and determines whether the ensuing intervention policies and programmes will succeed or fail. Rondinelli (1993:vii), who regards development projects as policy experiments, appropriately suggests that public sector organisations must be reoriented to cope effectively with the uncertainties and complexities of the development process so that the beneficial effects of development policies are experienced at the grassroots. According to Hulme (2003:1), chronic rural poverty[6] can only be effectively alleviated when policy reaches the rural poor. Rondinelli (1993:185) argues that grassroots participation[7] ensures that the benefits of rural and agricultural development reach the rural poor. As will be discussed in Section 7.9.1 of Chapter 7, nonparticipation at community level has had profound effect on irrigation technology transfer and development at Qamata.

It is worthwhile to define the rural poor and their most common livelihood option (rain fed agriculture) in relation to public policy inasmuch as such discussion facilitates the understanding of the questions raised and other pertinent issues (implicit in the title of the study) required to define the central problem this thesis seeks to address. Clearly defining poverty and being poor is a crucial step towards accurately measuring the success or failure of any rural development effort (van der Walt 2004:2). As Aliber (2003:473) has noted, one of the major constraints to addressing poverty in South Africa

[6] The chronically poor are those who endure poverty for a long time or throughout their entire lives; they cannot escape poverty without external assistance and are usually difficult to assist because they benefit least from economic and social development (Aliber, 2001:2-3).

[7] Participation is an active process by which stakeholders influence the direction and execution of a programme or project with a view to improving their well-being in terms of personal growth, self-reliance or other values which they cherish (Theron, 2005:111-112). Participation allows the poor a voice, and through a transfer of responsibility gives them the power to discover and determine ways to improve their lives. Participation of the poor in development intervention programmes is the foundation of rural poverty alleviation because it nurtures and develops human assets (skills, knowledge and health) and social capital (networks, relationships and trust which people draw on in search of livelihood opportunities). Participation is pro-poor, and a precondition for rural and agricultural development.

relates more to policy-makers' understanding of the nature of poverty they are trying to address as well as the appropriate policies for the different types of poverty than to the lack of delivery capacity or financial resources.

1.1.1 Defining South Africa's rural poor

Poverty means different things to different people because of the differences in people's background and exposure (Frye, 2005:3-5; Hulme and McKay, 2005:4-5; van der Walt, 2004:2). Most social analysts define poverty as a condition of unacceptable human deprivation (Triegaardt, 2007:1; Province of the Eastern Cape, 2003:7). Triegaardt (2007:1) for example defines poverty in terms of the inability of individuals, households or communities to secure access to "sufficient resources to satisfy a socially accepted minimum standard of living". However, it is the poor people who know exactly what they consider to be poverty. The local communities in contemporary South Africa perceive poverty as a multidimensional reality and thus comprehend it "not only as lacking or being deficient in income, but also being isolated, lacking water supply, inadequate education and health services and the inability to participate in the economic and social life of the community" (Statistics South Africa, 2006:xxiv). Much has been written about rural poverty because it inflicts damage on those who endure it as it prevents them from realising their human potential and violates their rights to self respect and life (FAO, 2002:1; Constitution of the Republic of South Africa, 1996: Chapter 2).

Poverty in South Africa exhibits racial, gender and spatial attributes. The majority of the poor people in the country are blacks, constituting over 90% of the approximately 22 million poor South Africans (Miceli, 2004:37; UNDP, 2003:42). Poverty is prevalently rural particularly in the former homelands: over 65% of the poor reside and earn their livelihood in rural areas and as much as 78% of the chronically poor are also found in rural areas (Machethe, 2004:1). There are 2,5 million people who are 65 years and older in South Africa (Statistics South Africa, 2007:4) of which 69% reside in rural areas (May, 2003:7). Hassim (2005:5) argues that generally black rural women are the poorest category of citizens in South Africa: "65% of African female-headed households in rural areas [are] poor compared to 54% of male-headed households".

There is no official poverty datum line (PDL) in South Africa (Maclennan, 2008:1; Frye, 2005:13; May, 1998:18). However, as will be discussed in Section 7.2 of Chapter 7, this study deems any individual subsisting on an income below the poverty datum line of R376 per month to be poor[8]. The rural poor reside and earn their livelihood in rural areas where living conditions (in terms of personal consumption and access to education, health care, potable water, sanitation, housing, transport, and communications) are poor. In South Africa, the rural poor are not a homogeneous group although they depend on agriculture and related off farm ventures for their livelihood. Those who are directly engaged in agriculture have access to land as smallholders and tenants; the non-farmers belong to the class of the self-employed and landless, unskilled workers. Much functional overlap exists between the farmers and non-farmers. Since not all the farming households can sustain themselves solely on the small plots they cultivate, some provide labour to others to supplement their earnings or are also engaged in off farm activities (see Section 6.3 of Chapter 6). Khan (2001) contends that the poorest among the rural poor are the landless unskilled workers who depend on seasonal demand for labour in agriculture and the informal sector. A greater portion of the poorest stratum consists of women, the elderly and the disabled (Khan 2001).

The lack of employment opportunities is the single most important cause of rural poverty. As Aliber, (2003:480) points out, in 1999, 51% of the rural black workforce was unemployed. However the problems of rural poverty are exacerbated by the lack of access to productive resources: as many as 1.4 million rural households in the former homelands have no access to arable land and grazing fields (Statistics South Africa (1999:1) because of the overcrowded conditions (it will be discussed in Chapter 3). Rural poverty in the former homelands is aggravated by low levels of education, high number of single-parent and child-headed households and the return of the aged, the sick and retrenched workers from the urban centres. South Africa's unique

[8] A poverty datum line is an absolute threshold for distinguishing between the poor and non-poor. It indicates the amount of money required for a household to sustain a basic livelihood consisting of minimum food requirements and other essential supplies and services (Statistics South Africa, 2007:9). The choice the PDL of R376 per month per person is based on the outcome of Frye's (2005) attempt to compile a PDL for South Africa. What makes Frye's finding pertinent to this study is that Frye's data and the data which constitute the basis of this study were both solicited in 2004 and the PDL was estimated at 2004 prices.

configuration of poverty is the result of its historical experience (Triegaardt, 2007:2; CSIR, 2004:118; Aliber, 2003:474). The section which follows provides the context within which to place the policies and processes that resulted in the unique characteristics of South Africa's rural poverty.

1.1.2 The structure of South Africa's rural economies

South Africa has a dualistic agrarian structure, sharply divided along lines of race. "It was the product of the particular trajectory of capitalist development that emerged under colonialism and apartheid" (Miceli, 2004:34). The dualism is manifested by the division of the rural areas into commercial farming areas owned and controlled by whites, and communal areas owned by the state and historically administered by tribal authorities. Public policies such as the Native Land Act of 1913 and Native Trust and Land Act of 1936 ratified pre-colonial and colonial dispossession of the land of the indigenous people (see Chapter 3). Consequently many households in the former homelands became landless and many others were left with small pieces of land which partly account for the widespread subsistence agriculture in the former Transkei and Ciskei (Aliber, 2003:474).

The dual agrarian structure of rural economies has created imbalances in the coping strategies and mechanisms of the rural populations. On one hand are the commercial farmers, mainly whites and a smaller number of blacks, who benefited from the previous systems of politics of separate development and land administration, and on the other, a larger number of peasants, concentrated largely in the former homelands (Greenberg, 2003a:15; Nel and Binns, 2000:371; Carter and May, 1999:9). The concentration of a large number of low productivity peasants in the former homelands is evidenced by the result of Statistics South Africa's survey of large and small-scale agriculture in 2000, presented in Table 1.1 below.

The most revealing aspect of the survey concerns the distribution of farm income: only 8,2% of the total farming operations are situated in the former South Africa but they receive 98,85% of the total farm income (Statistics South Africa, 2002:10). In the former homelands, farm income accounts for 23,2% of total income from agriculture and the remaining 76,8% is accounted for by non-farm income; however, in the former South Africa non-farm income constituted only 5,4% of income from agriculture and farm income accounted for a staggering 94,6% (Statistics South Africa, 2002:11-12).

Table 1.1 Number and types of farming operations by geographical regions in South Africa in 2000

Type of operation	Former South Africa	Former Homelands	TOTAL
TOTAL	**176 000**	**1 971 000**	**2 147 000**
Livestock and poultry	84 000	614 000	698 000
Cereals tuber and root crops	56 000	799 000	855 000
Vegetable crops	19 000	330 000	349 000
Fruit crops	17 000	228 000	245 000

Source: Statistics South Africa (2002:8)

It is thus true to argue that in black rural South Africa agriculture provides weak impetus for the development process. Most of the peasants farm as their forefathers did, using rudimentary tools and often relatively primitive methods of production. They cannot produce much food no matter how fertile the land is or how hard they work (Lahiff, 1999:14-16; Shultz, 1964:3). The socio-economic and physical environments present seemingly formidable constraints on traditional subsistence agriculture and cannot meet the demand for increased fibre and food production.

1.1.3 The real rural situation

Drought is the main problem in the rural areas in the former homelands and accounts for much of the precariousness of the fragile livelihoods of the majority of the rural poor. The gravity of the situation can be best grasped if one considers the fact that over 80% of the rural dwellers in the ex-homelands find employment in the agricultural sector but produce only a third of their food requirements (Aliber, 2003:474). Besides, off-farm employment opportunities are almost non-existent owing to the general low levels of production and investments in the countryside. The rural economies of the homelands are therefore characterised by high rates of disguised unemployment, unemployment, poverty, deprivation and malnutrition with all their attendant consequences. The factors that shaped the rural economies in the former homelands will be discussed in Chapter 3.

The landless, women, children, the aged and people with disabilities bear the brunt of poverty because they are weak in terms of the struggle for survival in the sea of rural poverty. The burden of production, for instance, rests on the shoulders of women as they constitute the majority of the rural population because their male counterparts have migrated to seek employment on the mines, commercial farms or in the urban areas (Festus, 2003:170; Greenberg, 2003b: 98; Republic of Transkei, 1991:43).

The awful spectre of poverty, deprivation and hunger that looms in the countryside in the Eastern Cape suggests that the political and planning authorities fail to respond in good time and adequately to mitigate the effects of drought. South Africa is located in the subtropical high-pressure belt where semi-arid conditions prevail. Therefore, drought is an important element of the natural environment that must be coped with because water is a vital resource for economic development and sustainable management of the environment (Langford, 1999:1). In the rural setting where the majority of the inhabitants are employed in the agricultural sector, irrigation technology could offer a long term solution to the problems of drought and hence low agricultural productivity and poverty (FAO, 2007:4; Machethe, 2004:1-2; Langford, 1999:1-2). In the Eastern Cape Province, 89,5% of the farmers largely in the former homelands rely on rain for production (Statistics South Africa, 1999: 5.2.5). Irz, Lin, Thirtle and Wiggins (2001), using regression analysis, empirically proved that in Africa for every 10% increase in farm production, there is a 7% reduction in poverty, and in Asia the corresponding reduction in poverty is 5%. Similarly, Machethe, Mollel, Ayisi, Mashatola, Anim and Vanasche (2004) have demonstrated, though qualitatively, that in Limpopo Province, agriculture plays a major role in poverty alleviation. The most prudent way of improving agricultural production, from the above exposition is via the transfer of irrigation technology.

1.1.4 Characteristics of traditional agriculture

Traditional dryland agriculture is practised in the rural areas throughout the Eastern Cape with the exception of a few irrigation and resettlement schemes. The farmers rely on indigenous technology developed through natural and human selection of crop varieties and the evolution of inputs and methods of land use (Mutimba, 1997:15). The agrarian technology in these societies is not the result of purposeful scientific research and does not follow any definite and systematic scientific methodology although with the passage of time some procedures and practices have become refined and institutionalised (mostly through superstitions, customs and conventions).

Traditional agriculture is characterised by low use of purchased inputs. The indigenous agrarian techniques used more land and labour and less capital such as hoes and manure, and animal-driven single-furrow wooden ploughs in the advanced stages (Mutimba, 1997:15-17). The most limiting factor under the indigenous system of agrarian production is the farmers' reliance on rainfall for most agricultural operations; productivity of resources is very low because rainfall has always been inadequate especially in the interior of the Eastern Cape Province (Van Averbeke *et al*, 1998:1). Output per person, yields per hectare and other measures of productivity tend to be low. Hence, traditional farmers are poor. The households consume most of the farm produce (mostly maize, sorghum, beans, potatoes, pumpkins and vegetables) and the surplus is sold locally. Products sales and purchases mean that the traditional farmers are closely linked to the local economy and thus respond to market signals. However, they oppose changes that do not fit into their farming system and which are likely to alter too abruptly the mechanisms they have developed over time to reduce risk.

Widespread poverty in the Eastern Cape's rural communities suggests that the indigenous agrarian technology needs to be replaced by a system that produces higher output but uses less land and more labour (e.g. the use of high yielding hybrids, fertilizers and irrigation). The adoption of 'less-land-more-labour-high-output' technology is more likely to bring relief to the rural poor (Norton and Alwang, 1993:268). However the technology that could transform the sub-subsistence rural economy to self-reliant and perhaps surplus-producing economy could only be developed through research and the application of science, the kind of expertise the indigenous system lacks. Indeed, as will be indicated in Section 4.3 of Chapter 4, the development policy of Qamata Irrigation Scheme (QIS) reiterates the need to step up farm production through irrigation technology transfer. The section that follows discusses the progress that has so far been achieved in the rural areas in South Africa since 1994.

1.1.5 Rural development policies in post-apartheid South Africa

At the end of apartheid a greater proportion of the black rural population lacked access to basic needs and services (SALGA, 2004:8-9). The general consensus was on the need to revamp and reorientate the rural economy in order to bring the rural poor into the mainstream of social and economic development. The resultant approach to development was a hybrid of models. At the extreme left of the policy spectrum is the Reconstruction and Development Programme (RDP) characterised by the basic needs approach (Fényes, van Rooyen, Ngqangweni and Njobe-Mbuli, 1998:23) and to the right is the Growth, Employment and Redistribution (GEAR), consisting of elements of structural adjustment programme with a focus on institutions and markets, and a drive towards global integration based on trade (Hall, 2004:220). What is noteworthy about post-apartheid official policy on rural development in South Africa is the absence of any reference to agrarian reform (Cousins, 2002:3). However, the prevailing land tenure arrangements in the former homelands impact negatively on irrigation and agricultural development (see Section 2.9.1 of Chapter 2). The official policy on rural development shifted towards neo-liberalism which envisages an incremental improvement in the rural economy within the existing social and economic framework (Greenberg, 2003a:17). Some of the propositions in the RDP were thus abandoned (Davids, 2005:44), including the establishment of a national Ministry of Rural Development and Land Reform (African National Congress, 1994:85).

The 1995 Rural Development Strategy (RDS) introduced a cost recovery agenda which limited the rural poor's ability to access essential services they were denied under the apartheid system (Miceli, 2004:27; Greenberg, 2003a:19). The GEAR and its offspring, Rural Development Framework (RDF) consolidated the cost recovery approach to the provision of social and economic infrastructure ostensibly to render the development process sustainable (Miceli, 2004:27). The RDF and the subsequent Integrated Sustainable Rural Development Strategy (ISRDS) of 2000 gave prominence to local governance because planning at local government level was seen as a way of generating accurate local data to ensure tighter fiscal planning (Rural Development Task Team, 1997:67).

The post-apartheid rural development policies, notably the RDP, Integrated Development Planning (IDP) and ISRDS, are characterised by the concern for integrated development, sustainability of the development process and grassroots participation (Mather, 1996:41; Davids, 2005:43-44). The introduction of various social welfare grants such as the child welfare grant were part of the safety net strategy to partially cater for the victims of the development policies. A notable exclusion from these policies was a comprehensive and systematic plan to train and impart essential technologies and skills to the rural poor to enable them to become self sufficient in providing for their own requirements and incomes to access essential services. As will be discussed in Section 7.9.3 of Chapter 7, the lack of skills in the rural areas adversely affects irrigation and agricultural development. Besides, the post-apartheid rural development policies do not offer any systematic plan to develop agriculture, the mainstay of the rural economy. They have therefore had limited positive impact on rural poverty and the government blames the situation on “inadequate capacity and systems to monitor implementation” (Mbeki, 2007). If rural development policies are to generate essential impetus for rural development then the problems of inadequate technology and skills and unreliable and inadequate rainfall that bedevil the agricultural sector and account for its low productivity ought to be solved through irrigation technology transfer. Recent studies by the United Kingdom’s Department for International Development (DFID) (2002a:iv) and the World Bank (2005:1) indicate that agricultural growth has the potential to make a remarkable contribution towards the achievement of the objectives of the Millennium Development Goals (MDGs)[9].

1.1.6 Defining irrigation and irrigation technology transfer

Irrigation is the deliberate application of water by humans to the soil for the purpose of supplying moisture essential for plant growth (Encarta Encyclopedia, 2000). It is an ancient worldwide agrarian practice. Indeed, irrigation offered socio-economic stability for most ancient civilizations in Africa and Asia to flourish (Department of Water Affairs and Forestry and

[9] The MDGs aim at (i) halving the proportion of people living on less than $1 per day, (ii) promoting gender equality and empowering women, (iii) achieving universal primary education, (iv) reducing child mortality, (v) improving maternal health, (vi) combating HIV/AIDS, malaria and other diseases, (vii) ensuring environmental sustainability and (viii) developing a global partnership for development by the year 2015 (United Nations Organisation, 2005:3; World Bank, 2005:2).

Department of Agriculture, 1996: Preface). However since the Second World War it has been overtly accepted as an important means of initiating and sustaining social and economic transformation of rural areas in the Third World. In Africa, for instance, irrigation development has often been given high priority by policy and decision makers because it is seen as a prudent intervention programme to modernize agricultural production, reduce food imports and mitigate the impact of droughts (Elahl and Khushalani, 1990:69-72; Moris, 1987:99). Irrigation farming is particularly important in marginal areas where farmers have little or no hope of getting good yields because of inadequate rainfall. Perret and Touchain (2002:2) argue that in South Africa the location of the irrigation schemes in remote rural communities in the former homelands “represents a potential for poverty alleviation and food security in such areas”.

Apparently, the absolute availability of water via irrigation systems has not impacted positively on rural livelihoods in the former homelands. What is needed is an appropriate development policy which defines the appropriate irrigation technology and support services required to apply the available water to increase production. Irrigation technology thus denotes the expertise, skills and resources that smallholder irrigation farmers need in order to apply the available water to increase agricultural production and not merely the conveyance of water to cultivated fields (see Section 2.9.1 of Chapter 2). There is no doubt that the basic cause of the failure of irrigation schemes in the former homelands to accomplish their intended objectives relates more to organisational and operational structures than to engineering and agricultural technicalities of the programmes. Since irrigation farming normally leads to increases in agricultural production, the irrigation development policies in the former homelands ought to have envisaged that the participating rural communities would need more technical and production, entrepreneurial and management skills and institutional support services (such as marketing and credit facilities, training and pricing policies) to cope with the challenges associated with increased production. The lack of any (or a combination) of these vital factors is likely to impact negatively on rural poverty alleviation efforts and strategies (Perret and Touchain, 2002:5). As will be illustrated in Sections 4.4.3 of Chapter 4, 7.9.3 of Chapter 7 and 8.10 of Chapter 8, institutional and organisational support are the key factors, among others, that determine the performance of the Qamata Irrigation Scheme. Thus besides the provision of water for cultivation, the definition of irrigation should be broadened to include the provision of institutional support.

Similarly, the transfer of irrigation technology should not be viewed only in the limited context of the supply of water and modern agricultural machinery to rural communities to augment crop production capacity of a limited number of farmers. The term '*transfer of irrigation technology*' is used in the context of this study to denote (technical) capacity building that ensued in the rural communities which were provided with irrigation water for agricultural production. Irrigation technology transfer is therefore defined to include the training of the local participants that facilitates self-reliance, increased production, acquisition of technical skills in crop production, the use of local resources and expertise, optimum use and maintenance of equipment and resources and processing and marketing of produce to render agricultural production in participating communities profitable and sustainable. The definition of irrigation technology (which is embodied in equipment, resources and expertise) is broadened to include techniques that make the art of production in rural communities less strenuous, time-saving and more labour-intensive and permit the use of less land and marginal areas to step up production.

1.1.7 Irrigation development in South Africa

The introduction of irrigation farming into South Africa dates far back to the arrival of European settlers in the country in 1652 (Perrret, 2001:3). The earliest irrigation development projects were undertaken by individuals, groups and town development committees, where canals and furrows were constructed to convey water to cultivated fields and gardens (Van Averbeke *et al*, 1998:1). From 1912 onwards irrigation development became a well-coordinated affair (Perret and Touchain, 2002:4). During the Great Depression of the 1930s irrigation schemes and projects provided the South African government with a way of addressing the problems of unemployment and deprivation of the "white poor" and also reducing influx of rural whites into the cities (Van Averbeke *et al*, 1998:1; Vaughan, 1997:3). The primary aim of the irrigation development policy was to increase agricultural production and reduce rural poverty through the creation of rural employment opportunities. Irrigation, in this context, is conceptualized as possessing the potential to place a rural area in a more competitive position with other regions in terms of contribution towards regional development and geographical distribution of welfare from a national point of view. For example, the development of Vaalhart Scheme was followed by the establishment of Vaalhart Agricultural Cooperative in 1944 and other agro-based industries which supplied farming inputs and processed farm output to broaden the socio-economic impact of the scheme (Viljoen, 1988:11).

In the former white rural areas irrigation could initiate and sustain socio-economic transformation because the irrigation programme was backed by appropriate and insightful rural and irrigation development policies. Besides the huge initial capital required for the construction of the necessary infrastructure to convey water to the fields, the policies made provision for institutional support for the irrigation communities (Vaughan, 1997:4; Department of Water Affairs, 1986; Republic of South Africa, 1956). The development policies provided for the development of commercial agriculture with the sizes of the plots allocated to individual participating farmers ranging between 17 and 25 hectares (Vaughan, 1997:3). The introduction of irrigation farming was perceived as a holistic transfer of an all-important agricultural technology to the participating rural communities. The participants were thus empowered to apply the available water to increase productivity in existing livelihood forms and subsequent water-based ventures that emerged through training and extension service.

The success of the irrigation schemes established in the 1940s motivated the development of many state sponsored white commercial irrigation and resettlement schemes in South Africa to fight rural poverty and exclusion (Vaughan, 1997:4). Similar socio-economic and political motivations underlay the establishment of the state sponsored smallholder irrigation schemes in the former Bantustans. For example, the irrigation development policy which will be discussed in Section 4.3 of Chapter 4 defined the objectives of Qamata Irrigation Scheme in terms of the need to alleviate poverty, create employment opportunities and achieve household food security at Qamata.

1.1.8 Irrigation development in the former homelands

Most of the major state sponsored irrigation schemes in the former homelands in the Eastern Cape (Figure 1.1) were established after the publication of the report of the Commission for the Socio-Economic Development of the Bantu Areas within the Union of South Africa (Tomlinson Commission) in 1955. Indeed, the Commission recommended that well planned but simple irrigation schemes, which reflected the needs and capabilities of the people of the Bantu Areas, be established as part of the programme to rehabilitate the black rural areas. The Commission's recommendation was based on the fact that at the time of publication of the report, 28 out of 37 existing small irrigation schemes in the former Transkei and Ciskei had been abandoned because they did not suit local conditions (Commission for the Socio-Economic Development of the Bantu Areas within the Union of South Africa, 1955:121).

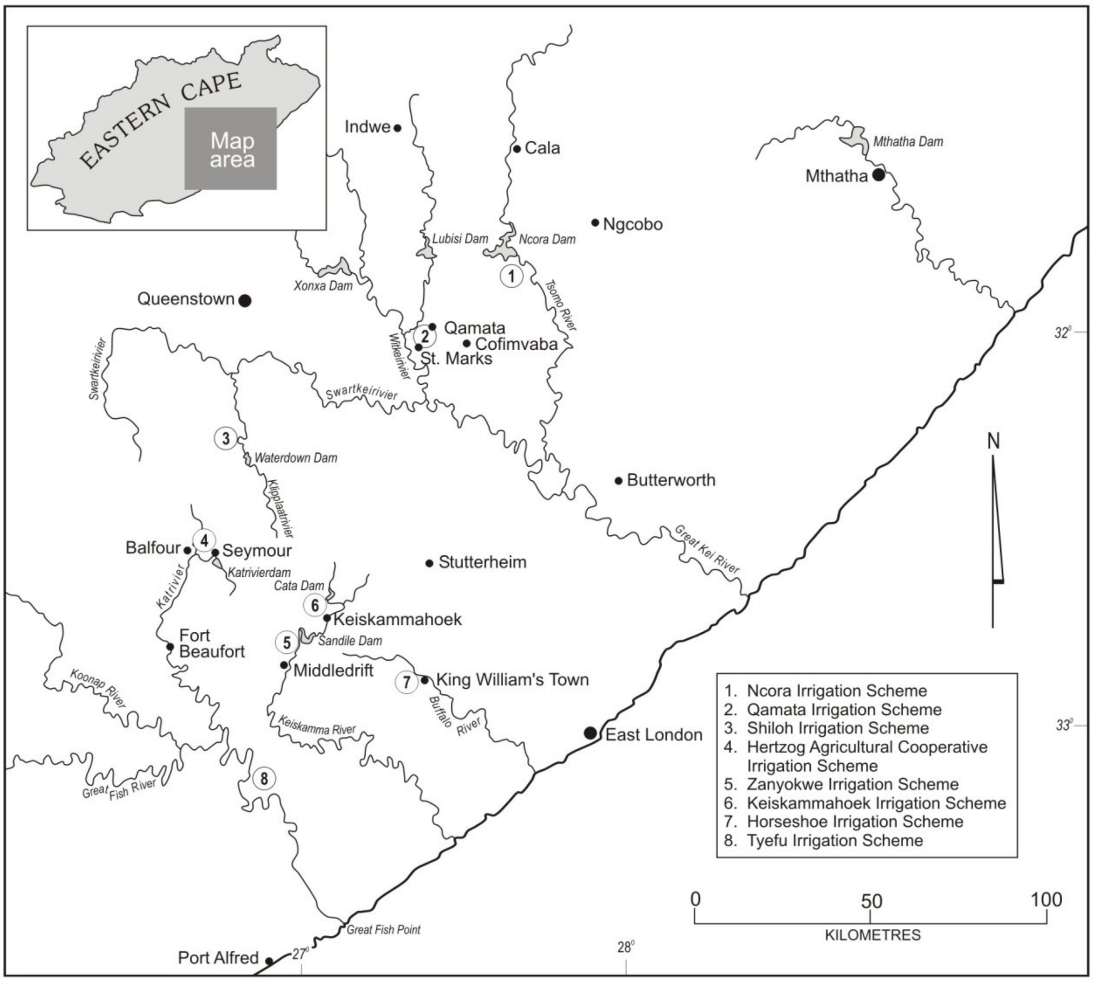

Figure 1.1 Major irrigation schemes in the former homelands in the Eastern Cape Province

In the late 1960s and 1970s, the political authorities in the self-governing territories of Transkei and Ciskei commissioned Loxton, Venn and Associates, a transnational firm engaged in agricultural development in southern Africa, to undertake baseline studies in the major river basins to identify the potential for agricultural development (Loxton, Venn and Associates, 1988:1). The firm, like the Tomlinson Commission, recommended irrigation development as the most appropriate option for agricultural and rural development in the two territories.

As will be discussed in Section 4.3.1 of Chapter 4, a typical Bantustan irrigation scheme in the Eastern Cape characteristically consisted of two units, namely, a “commercial entity” and a “food security oriented entity” (Van Averbeke *et al*, 1998:4; Xhosa Development Corporation, 1967:97). The rationale for the proposition was that the profits generated by the commercial sector would be used to provide inputs and equipment for the food security entity earmarked for the local community. In addition, it was thought that the profits from the commercial sector would enable the local farmers to access modern agricultural technology and skills to improve productivity. The establishment of state sponsored large irrigation schemes in the former homelands of the Eastern Cape began in the late 1960s and continued through to the late 1970s (Vaughan, 1997:2).

The term smallholder irrigation is used to describe the state sponsored irrigation schemes in the former homelands of South Africa such as the Qamata and Ncora irrigation schemes. They are large irrigation schemes in terms of area but are made up of many individual small farms operated by local farmers. The sizes of the farms range between 0,2ha to 10ha: the farms that are less than 5ha in size were classified by the operators of the schemes as small scale (subsistence) farms and were geared towards the production of food crops (Kay, 2001:3). Hence, the small scale irrigation farmers are referred to as food crop farmers or smallholder irrigators and the two terms are used interchangeably in this study. The farms whose sizes exceed 5ha each were classified as commercial farms and were operated by emerging commercial farmers in the local communities to cultivate cash crops. The terms ‘commercial’ and ‘subsistence’ were used in the questionnaires (Appendices 1 and 2) which were used to elicit data for this study to refer to the emerging commercial farmers and food crop farmers respectively.

1.1.9 Demise of irrigation schemes in the former homelands

The history of irrigation programmes in the former homelands as a whole and in the Eastern Cape in particular is mostly one of dismal failure (ARDRI, 1996:34; Republic of Transkei, 1991:246; 1978:10). As the analyses in Chapters 6 and 7 will indicate, high productivity remains elusive, acceptable cash incomes cannot be attained and the migration of the youth from the land to the urban centres cannot be halted. The Bantustan styled irrigation schemes were doomed to fail right from their inception because they were not guided by insightful development policies (Moris, 1987:100). A greater majority of the schemes have failed to generate returns commensurate with expenditure and the expectations of both planners and beneficiaries (Crosby, 2000:4) because essential preconditions (e.g. issues of sustainability, justification and local adaptability) were not met or simply ignored. The sheer size of the schemes presupposes that the baseline studies upon which their designs were founded failed to establish the needs and capabilities of the intended beneficiaries. Probably, they were not detailed enough owing to inadequate consultation and involvement of the local people (see Section 7.9.3 of Chapter 7). The fact that the state-financed irrigation schemes in the former Bantustans were huge and mostly capital-intensive means that their development was physically inappropriate to the resources available and did not suit the traditional farming practices of the beneficiaries.

The state maintained the schemes and provided support services such as land preparation, planting application of fertilizers and weeding to farmers (ARDRI, 1996:8). The support services were thus not geared towards capacity building. The functions, duties and responsibilities of the farmers were virtually taken over by the managing agents and the various agricultural departments. A culture of subsidized services and inputs and free supply of water for irrigation was established within the irrigation farming communities. The commercial entities were not viable enough to generate the financial resources needed to support the obnoxious culture (Van Averbeke *et al*, 1998:4). When the state's direct financial support was eventually terminated, most of the irrigation schemes became moribund and remained inactive for many years because the farmers could not finance their farming operations as they were neither viable nor sustainable (Crosby, 2000:6). The irrigation development policies in the former homelands in the Eastern Cape did not intend to create sustainable commercial irrigation farming units as in the former white rural areas because the sizes of most of the irrigated plots allocated to local farmers were too small to permit sustainable irrigation farming (see Section 8.3 of Chapter 8).

Perret and Touchain (2002:5) have identified the following, among others, as the major contributory factors that brought about the demise of irrigation schemes in the former homelands of the Eastern Cape:

(i) infrastructure deficiencies caused by inappropriate planning and design;
(ii) poor operational and management structures;
(iii) both the farmers and extension workers lacked the required technical expertise and ability;
(iv) partial or complete absence of grassroots involvement and participation;
(v) inadequate institutional structures and support; and
(vi) inappropriate land tenure arrangements.

Crosby (2000:11) shares similar sentiments as he writes "… the pattern of failure [of smallholder irrigation projects in the former homelands] is so similar that it is not necessary to undertake a needs analysis for individual projects". What one gleans from Crosby's (2000:11) assertion is that a major common factor might have accounted for the failure of state sponsored irrigation schemes in the former homelands. The fundamental flaws in the irrigation development policies are the common factor that spelt the doom of the irrigation intervention programmes in the former homelands (Perret and Touchain (2002:5; Crosby 2000:11).

1.2 The problem

The dryland farmers in the semi-arid regions of the Eastern Cape cite inadequate rainfall and the lack of know-how, capital resources and institutional support as the principal factors underlying their problems of low agricultural productivity and poverty (Kodua-Agyekum, 1997:211-215). One is inclined to believe that irrigation farmers are better off because they have access to water, new techniques of production, extension services and subsidized inputs. A visit to any smallholder irrigation scheme in the province however suggests that such an impression is only wishful thinking. Evaluation of state financed irrigation schemes in the ex-homelands revealed that they all share a common fate: poor design as a result of inappropriate policies (TCOE/Eastern Cape Cluster, 1999:11; ARDRI, 1996:24; Rossouw and Bembridge, 1993:359). The irrigation projects engaged largely unskilled farmers with extremely low levels of education and training. Hence, as the analyses in Chapters 6, 7 and 8 will depict the aim of developing rural communities through poverty alleviation, employment creation and household food security by way of irrigation technology transfer remains elusive. The irrigation schemes were neither viable nor self-sustaining.

In 1996 the Eastern Cape Provincial Government, in consultation with the national Department of Agriculture and Land Affairs, developed a policy in which the irrigation schemes were transferred to the participating land right holders and farmers, and the government's direct involvement and support were totally withdrawn (TCOE/Eastern Cape Cluster, 1999:12). The poverty stricken illiterate farmers are now charged with the task of salvaging the malfunctioning irrigation schemes in the province. Besides capital and fiscal resources, have they acquired sufficient skills and expertise to successfully run the schemes on their own? Surely, something might have been wrong with both the initial policies which led to the establishment of the irrigation projects in the former homelands of Transkei and Ciskei and the subsequent policies which eventually transferred them to the participating rural communities.

1.3 Aims and objectives of the study

This study aims to investigate the effects of irrigation technology transfer in the Qamata area in the Eastern Cape from policy and development perspectives. The Qamata Irrigation Scheme will be the focus of the investigation. According to Holbrook (1997:83), with the exception of Tyefu Irrigation Scheme (also in the Eastern Cape) no proper analysis of the policy and social impact of irrigation schemes have been made in the entire southern African subcontinent. Earlier studies and reports of commissions of enquiry largely concentrated on economic and technical aspects of irrigation schemes in verification of their viability. Thus little is known about the role and effects of irrigation development policies and the socio-economic relations that emerged in the participating communities.

Moreover, this study puts under the spotlight the contention as to whether the irrigation schemes, now managed and run by poverty stricken illiterate farmers can be viable and sustainable enough to generate development impetus and social change in the participating rural communities. The crux of the matter is that irrigation development policies in the former homelands of Transkei and Ciskei did not provide for effective transfer of irrigation technology to the participating communities. For example, in the former Transkei the official agricultural and rural development policy, 'The Transkei Agricultural Study' (Republic of Transkei, 1991:180-181) lamented the dearth of essential technical farming skills in the territory. However the policy did not spell out any plan to address the problem in order to pave the way for the emergence of sustainable commercial farming in the communities engaged in irrigation farming. Since the primary focus of irrigation development policy in the former homelands has always been poverty alleviation, the effectiveness of irrigation technology transfer policy is assessed not only on the basis of its contribution to the overall volume and value of production but also in terms of capacity building: the skills and know how the rural people have acquired to manage their livelihood options and strategies effectively. Therefore, this study, as will be exemplified by Chapters 6, 7 and 8, focuses specifically on the following objectives mostly derived from the definitions of irrigation and irrigation technology transfer discussed in Section 1.1.7 of this chapter:

(i) to investigate the effectiveness of the irrigation development policy in terms of the organisational and institutional arrangements, support and services that were instituted to facilitate the transfer of irrigation technology to the Qamata irrigation farming community;
(ii) to examine the use of local resources by the smallholder irrigation farmers and the techniques of farm production in use at Qamata;
(iii) to assess the acquisition of technical and entrepreneurial skills in the fields of production, management and marketing in order to handle increased production;
(iv) to investigate the contribution of Qamata Irrigation Scheme towards the solution of the problems of poverty, food insecurity, unemployment and outmigration of people at Qamata; and,
(v) to offer recommendations to assist policy and decision making to make the Qamata Irrigation Scheme self-sustaining.

The approach of the study towards the attainment of the above stated objectives is focused on investigating the Qamata Irrigation Scheme as a project and analyzing the outcome with reference to the scheme's development and management policies.

1.4 Hypotheses

The objectives of the study and conceptual analyses of the development of irrigation projects in the former homelands of Eastern Cape so far suggest the following hypotheses.

(i) From the perspective of institutional support and services, it is suggested that the extent to which QIS achieves its intended objectives depends on the nature of institutional support, services and arrangements that are made available to the participating farmers. Institutional support and services include *inter alia* social and economic infrastructure such as electricity, potable water, health facilities, transport and communication network, marketing, pricing and credit policies and training facilities for technical capacity building in the fields of production, management and processing and marketing of produce (see Sections 4.4.3 of Chapter 4 and 7.9.2 of Chapter 7).

(ii) On techniques of production, it is proposed that the correct application and use of modern methods of agricultural production that accompanied the establishment of QIS by the local farmers depend on the availability and affordability of the necessary resources. Resources include expertise (the ability to use and maintain equipment), equipment (tractors for ploughing, planting and transportation) and inputs (fertilizers, seeds pesticides and herbicides) (see Chapter 7).

(iii) From a public policy perspective, it is suggested that the extent to which QIS could accomplish its intended objectives is the function of the quality of the irrigation development policy that established the scheme. Development policy determines the objectives of the scheme and the institutions, processes, regulations and management required to steer the scheme to the defined objectives (see Sections 4.3 of Chapter 4 and 8.1 and 8.2 of Chapter 8).

(iv) On entrepreneurship and management, it is proposed that the efficiency of QIS in reducing rural poverty and ensuring food security is directly proportional to the ability and preparedness of the irrigators to seek opportunities and bear risks (Emery, Wall and Macke, 2004:82). The hypothesis is premised on the assumption that owing to low levels of education and the lack of training facilities at QIS, a class of local entrepreneurs could not be developed to invest in agricultural development and non-farm ventures in order to guide the project towards its intended objectives (see Sections 7.9.3 of Chapter 7 and 8.3 of Chapter 8).

(v) From the perspectives of social relations, it is proposed that the establishment of QIS has caused changes in the social and economic relations in the Qamata area. The proposition is predicated on the assumption that the weaknesses in the irrigation development policy at Qamata have created socio-economic inequalities (see Sections 6.2.1 of Chapter 6 and 7.2 of Chapter 7).

The set of hypotheses outlined above is useful for the investigation of the role of public policy in the transfer of irrigation technology for rural development at Qamata because it suggests the necessary data to solicit and the appropriate analytical tools as they will be discussed in Chapter 5.

1.5 Profile of the study

The study area (hereinafter referred to as Qamata area) is constituted by the QIS and nine villages surrounding the scheme, namely, Taleni to the north, Qamata Basin, Tatsi and Camama to the east, Nduluni to the southeast, Mkhonjane and Xabisaweni to the west and Luxeni and Rwantsana to the northwest (Figure 1.2). This section of the chapter intends to orient the reader on major aspects of the physical environment which influence rural and agricultural development in the area. The economic, social and political dimensions of community life in the Qamata area, as revealed by years of fieldwork, will be discussed in Chapters 6 and 7.

1.5.1 Physical background

This section deals with the physical background of Qamata area and how it influences socio-economic development of the area. The approach is premised on the notion that rural people have to modify aspects of the physical environment (e.g. water supply and soil fertility) through the use of technology to step up agricultural production to address the problems of poverty and deprivation (Bembridge, 1984:95). The knowledge of the physical background is therefore important to facilitate the understanding of the development policy required to cope with the opportunities and constraints that the physical environment presents to social and economic development at Qamata.

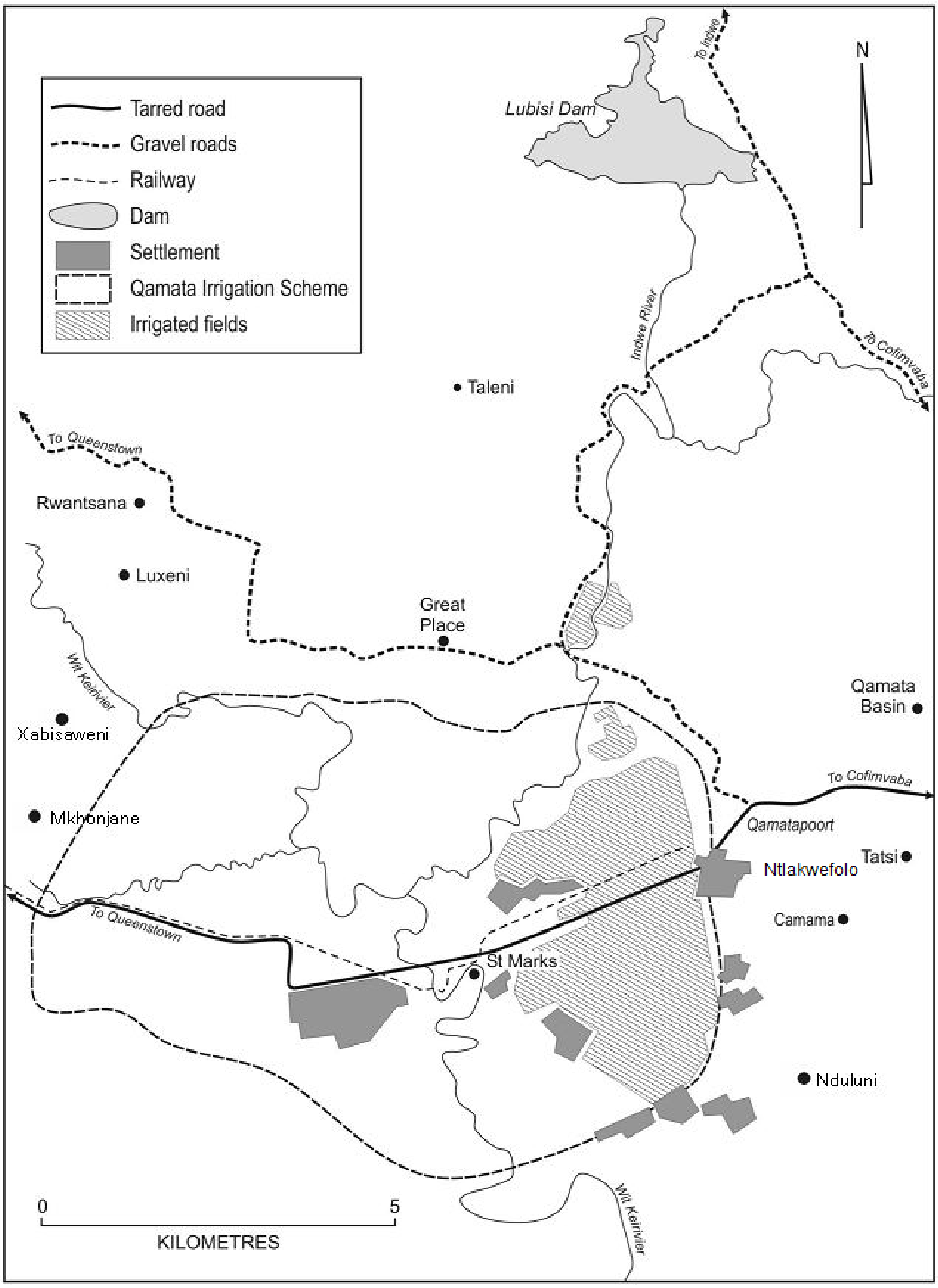

Figure 1.2 Map of Qamata Area

1.5.1.1 Location

The Qamata area is located in the southwest of the former Transkei now part of the Intsika Yethu Local Municipality whose administrative headquarters is at Cofimvaba (Figure 1.3).

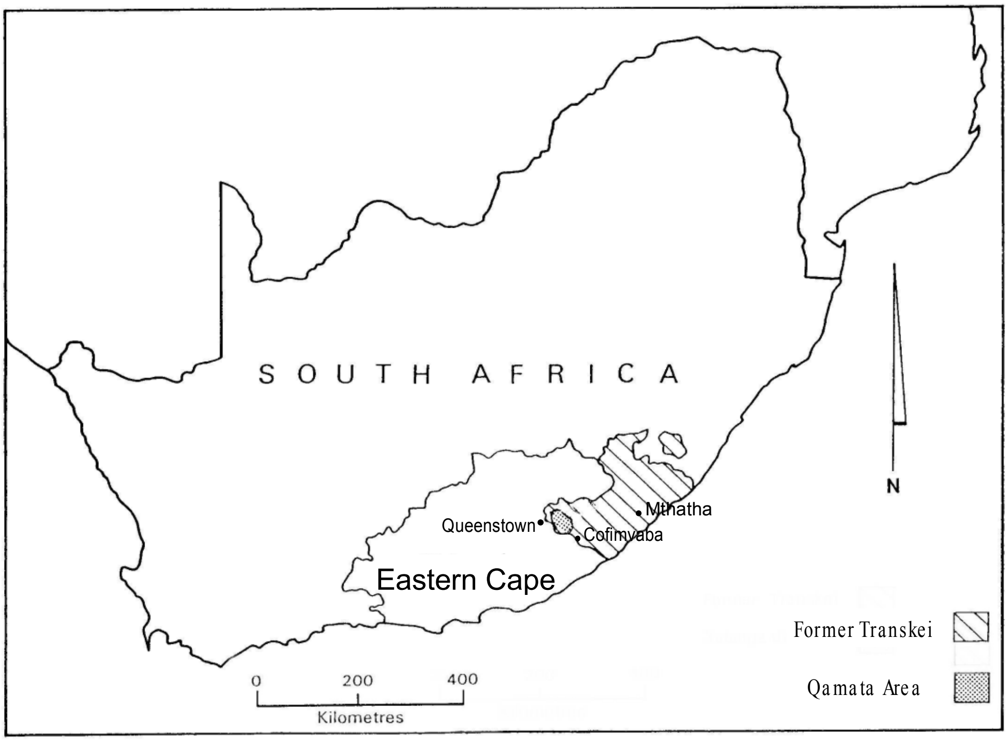

Figure 1.3 Locality map of Qamata Area

The Queenstown-Mthatha road (R63) traverses the Qamata area which is approximately 60km east of Queenstown, the administrative centre of Chris Hani District Municipality. Besides its location in the subtropical high-pressure belt[10] as indicated in Section 1.1.3 of this chapter, Qamata area is in the rain shadow of the Drakensberg Range; without irrigation, the area is consequently too dry for agricultural production and environmental stability (Van Averbeke *et al*, 1998:17). Its proximity to Queenstown and the main road that traverses the area provide an important market for local agricultural produce. The location of Qamata is essential for development policy analysis as it offers insights into the opportunities and challenges development effort in the area faces as a result of its location.

[10]The Qamata area is located between latitudes 31° 45′ 30″S and 32° 00′ 15″S and longitudes 27° 15′ 00″E and 27° 30′ 00″E (Chief Director of Surveys and Mapping, 1990).

1.5.1.2 Relief and drainage

The topography of the Qamata area is made up of a gently undulating basin, flanked by retreating mountains (Republic of Transkei, 1991:61-62). The fairly low gradient of the site of the scheme permits the use of agricultural machinery. However, the highly erodible nature of the soil on the slopes of the surrounding mountains poses a serious threat to the irrigated land. The most important river draining the area is the Indwe River, dammed at Lubisi to provide water for the Qamata Irrigation Scheme (Figure 1.4).

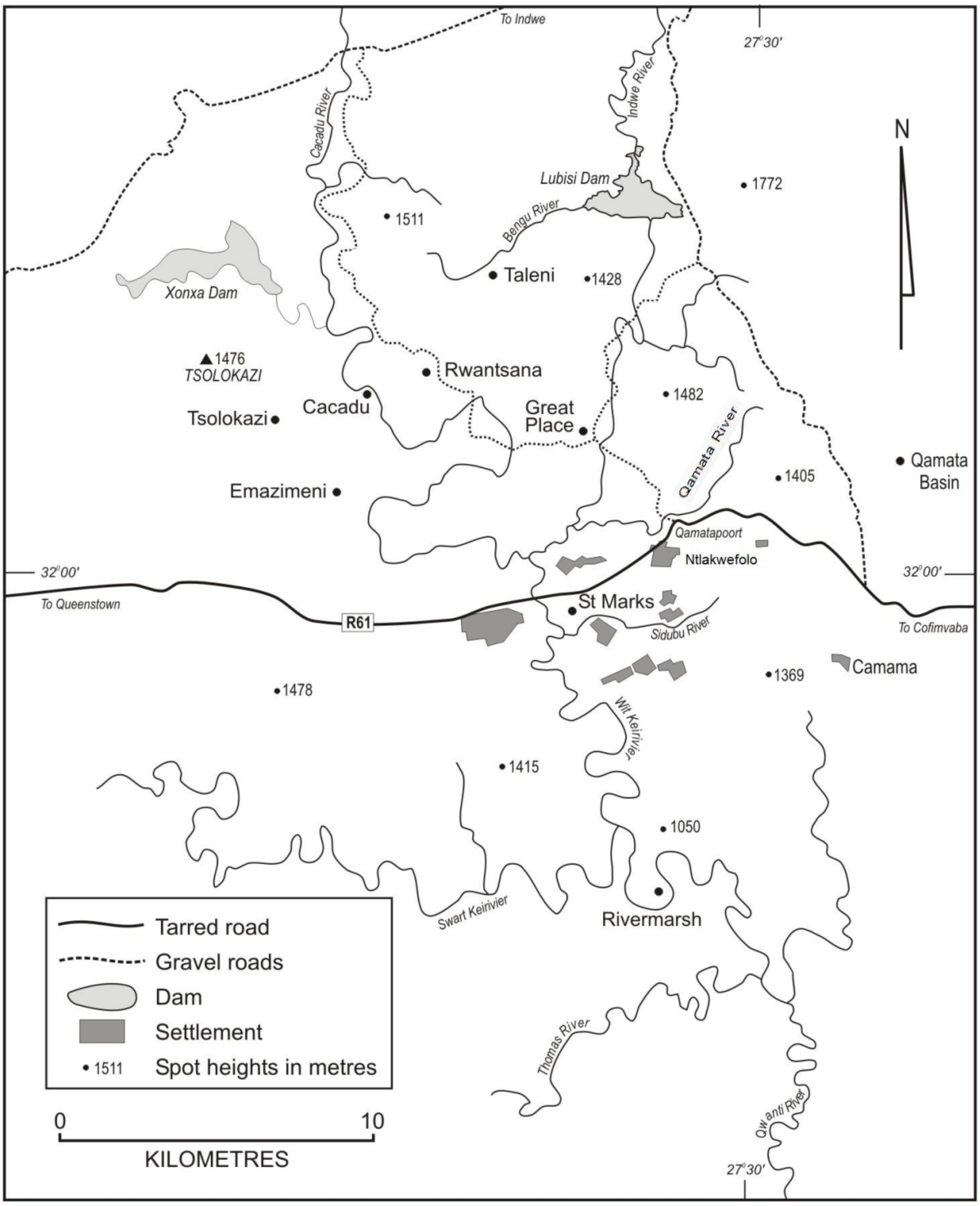

Figure 1.4 Relief and drainage map of Qamata Area

Qamata River and the White Kei River and their tributaries are spring-fed. The springs often dry up in winter and during severe droughts. With adequate conservation approach, the tributaries could maintain sustained flow because the surface run-off is quite high (ARDRI, 1996:8). It is therefore not surprising that soil conservation practices were instituted at the scheme under the betterment planning (see Section 3.4.3 of Chapter 3). The relief determines the nature and expanse of land available for cultivation and development and environmental policies such as soil conservation; and the drainage influences the amount of water available for irrigation. The topography and drainage of Qamata area thus influence the operation and maintenance costs and policies at QIS.

1.5.1.3 Climate

The Qamata area experiences a cool continental type of climate because of its location (Republic of Transkei, 1991:64). Rainfall averages 500mm per annum; it is highly unreliable in amount and distribution (ARDRI, 1996:9). The effectiveness of rainfall is reduced by high run-off and high summer temperatures[11]. Recurrent droughts are common and so is total crop failure in the dryland farming communities.[12] The climate of Qamata determines the amount of surface run-off available for irrigation, the types and variety of crops that can be cultivated and types and frequency of most natural disasters. Certainly, at QIS the climate influences operation and maintenance policies relating crop selection, irrigation scheduling and risks and disaster management.

1.5.1.4 Natural vegetation

The climax vegetation of Qamata area (dry Cymbopogon-Themeda veld) has been invaded by thornbush creating a kind of false bushveld (Republic of Transkei, 1991:69). Annual grasses and weeds dominate the landscape as a

[11] The average summer temperature varies from 24°C in September to 29°C between December and February. Winter is cold: the lowest temperatures are recorded in June and July when the level of mercury drops on the average to approximately 12°C. The area experiences winds of low to moderate speed and variable direction. Winds affect the production of crops such as tobacco, cotton and citrus (ARDRI, 1996:10).

[12] The researcher obtained this information at group discussions with extension officers at QIS on 2 September 2005 (Appendix 7, item 13) and dryland farmers at Qamata Basin on 7 September 2005 (Appendix 9, item 23).

result of overgrazing. The problem of sheet erosion makes it difficult to re-establish grass on the bare land. Bembridge (1984:109) contends that “the nutritional status of the veld” is ideal for livestock farming. Besides, the light forests which occur along river valleys are exploited to provide for the fuel needs of the people. As will be noted in Section 3.4.3 of Chapter 3, the betterment policy was extensively applied at Qamata to conserve the environment: excessive exploitation of land based resources and the consequential damage to the fragile environment was deemed as a very serious matter by the planning and political authorities. The sparse vegetation cover and the resultant soil erosion and the reduction in surface flow in winter influence operation and maintenance costs and policies at QIS (already indicated in Subsection 1.5.1.2 above). The natural vegetation of Qamata reflects the balance between the need for irrigation development and environmental stability.

1.5.1.5 Soils and soil erosion

The topsoil in the area consists mainly of alluvium (sandy loam). Of the 5 300ha of land in the basin originally earmarked for irrigation, only 47% is suitable for surface irrigation because the subsoil is less permeable (ARDI, 1996:14). Consequently, by the late 1980s 390ha of irrigated land was either saline or waterlogged (Maitin, 1990:1); the effectiveness with which the irrigated plots could be used for production is reduced. Owing to low rainfall and low temperature conditions, the soils in Qamata area are generally less leached and more fertile than those developed under more moist conditions and cooler temperatures (Republic of Transkei, 1991:73).

As noted in the preceding Subsections (1.5.1.2 to 1.5.1.5), soil erosion is a severe problem in the Qamata area. The overgrazed areas and where the plant cover disappeared during recent drought abound in signs of sheet and rill erosion (Plate 1.1). Heavy loads of sediments are deposited in the Lubisi Dam and the weir and lei dams, reducing their water storage capacities. The water which rushes down the steep slopes has tunnelled passages under the main canal causing cracking and eventual collapse of segments of the canal (see Section 4.3.6 of Chapter 4).

It is argued that the development policies under the apartheid system did not give much thought to environmental stability and sustainability (Mather, 1996:41; African National Congress, 1994:38). The inclusion of the physical aspects of Qamata in the study provides a means of examining the balance between irrigation farming and environmental stability.

Plate 1.1 Rills maturing into a gully on a steep slope at Qamata Basin

1.6 Relevance of the study

The need for the study struck the author in 1994/95 while undertaking a field survey in the former Xalanga District to investigate the rural development experience of the former Transkei (Kodua-Agyekum, 1997). A staggering proportion (95%) of the respondents with access to large tracts of arable land capable of sustaining commercial farming did not till their plots. Instead they limited their agricultural operations to homestead plots while their vast landholdings lay fallow although they barely had enough to survive on. The respondents claimed that it was too risky to cultivate the land because of inadequacies of rainfall and recurrent drought the corollary of which is crop failure and debts. However, they held the opinion that access to irrigation water could make them till the land and become better off within a short space of time. Similar views were echoed throughout the 21 administrative areas visited in Xalanga District including the extension officers interviewed. It appears the planners of smallholder irrigation schemes of the former Transkei shared similar sentiments: they regarded irrigation water *per se* as the panacea for farming problems in the semi-arid regions of the territory because the supply of water to most irrigation and resettlement schemes was not accompanied by adequate institutional support, assistance, supplies or extension service (Republic of Transkei, 1991:253 and 263). The simplistic impression of irrigation schemes, often incorporated into their conception and design, has not brought relief to the rural participants. Besides, it limits the capacities and horizons of the dryland farmers to anticipate alternative ways of improving agricultural productivity.

The above exposition attests the inevitable uncertainty and complexity of the transfer of irrigation technology to the rural people. The most promising way to accomplish the task successfully is to use adequate data to formulate an informed development policy to guide the irrigation development process. The paucity of adequate data has long been blamed for the failure of rural development strategies in Africa (Lele, 1975). The relevance of this study thus lies, *inter alia*, in its quest to generate accurate and adequate data to facilitate the understanding of the impact of irrigation technology transfer at Qamata. The data the study generates and the insights it offers can be used by planners and development functionaries to plan, execute, monitor and evaluate future irrigation development policies. The data can also be used to correct the erroneous but long standing opinion of irrigation schemes as the panacea for rural poverty and underdevelopment. In addition, it brings to the fore the most pressing organisational issues commonly referred to as institutional support and capacity building that development policy needs to address to render rural intervention programmes sustainable (will be discussed in Sections 8.9 and 8.10 of Chapter 8).

Most of the existing research works and reports of commissions of enquiry on the impact of irrigation technology transfer in the ex-homelands in the Eastern Cape are primarily rooted in positivist philosophies which regard social phenomena such as development as being value-free. The generalizations, conclusions and recommendations thus produced are often not based on or related to the perceptions of the people concerned. Public policies based on such ‘diagnostic’ findings often result in the imposition of inappropriate technology and programmes on the rural poor. As Bebbington (1999:2021) has observed, one fundamental reason why rural intervention programmes fail is probably that they misperceive the way rural people earn their livelihoods. This study investigates the impact of irrigation technology transfer at Qamata by incorporating the perceptions of both functionaries and beneficiaries in the research process through interviews and focus group discussions. The data that ensued is thus comprehensive enough to inform irrigation technology transfer policies in the future.

1.7 Scope of the study

The study investigates the farming, social and economic environments prevailing in the Qamata area with Qamata Irrigation Scheme as the primary focus of attention. It investigates the appropriateness and effectiveness of public policy in initiating and sustaining rural development via the transfer of irrigation technology to the people at Qamata. The study examines the ability of the irrigation scheme to transfer appropriate modern farming technologies and skills to the participating farmers and the diffusion of the technologies to the surrounding communities engaged in dryland farming. Thus the study does not only cover tools, mode of production and methods of cultivation, but also incomes from agriculture and allied occupations, life styles of households, marketing of produce, manpower development and the development of organisational and entrepreneurial skills, especially the ability to raise and use capital and credit.

The study encompasses non-governmental organisations (NGOs), government departments and parastatals assisting participants of the Qamata Irrigation Scheme. Particularly important are their roles in training and acquisition of relevant skills, infrastructure, extension and marketing services and the provision of inputs. All the factors enumerated above are investigated with reference to public policies aimed at ensuring sustainability of rural livelihood strategies.

However, the study does not consider the technical aspects of plans, programmes, technologies, tools and machinery. The technical details are the domain of the experts of agricultural engineering.

1.8 Limitations of the study

The initial stages of the fieldwork were fraught with problems, most of them unforeseen. My inability to communicate fluently and eloquently in Xhosa (the local vernacular) constituted an obstacle. The problem was overcome with the assistance of interpreters. The services of interpreters engaged during interview sessions and questionnaire administration and the enormous distance between my place of abode and the study area proved expensive. Unfortunately, no funding in the form of scholarship, grant, loan or bursary was secured for the study; the entire expenditure on the project was financed personally with the support of my family.

Most of the encounters with officials of state departments and other organisations were unpleasant: they were reluctant either to grant interviews or provide information about their institutions. Gathering data from such officials demanded persistent visits and long hours of waiting. The documents that proved difficult to secure were maps, plans and policies relating to the Qamata Irrigation Scheme.

Nevertheless, with perseverance and determination, all the problems were solved as they came. The necessary data was eventually procured and the researcher was able to undertake the required analyses and draw the necessary inferences and conclusions. I am glad to declare that the accuracy and quality of the study were in no way compromised by the problems encountered.

1.9 Structural summary

This thesis consists of nine chapters, the content of which is summarized as follows.

The first part of Chapter 1 provides a general background to the study, the problem statement, the aims and objectives of the study and the hypotheses which guided the research process. The operational definitions of rural poor, irrigation technology transfer and institutional support and services are discussed. The second part introduces the study area; besides, it discusses the relevance, scope and limitations of the study.

Chapter 2 discusses the theoretical and conceptual basis of development policy, irrigation technology and irrigation technology transfer. Attention is paid to the nexus between public policy, irrigation technology transfer and rural poverty alleviation. The factors which militate against the uptake of irrigation programmes in the former homelands in the Eastern Cape and sub-Saharan Africa are compared and discussed. The second part of the chapter discusses the post-apartheid irrigation development policy, the role of consultants in irrigation development in South Africa and irrigation management transfer (IMT) in the context of smallholder irrigation farming.

Chapter 3 presents an overview of the major policies which shaped rural livelihoods, development processes and technology acquisition in the former homelands of Eastern Cape. The chapter explores the stages and processes of agrarian development in the black rural areas before and after colonization and apartheid. This is followed by a review of prominent public policies which had profound impact on rural development. The role of Tomlinson Commission in the rural and agrarian development processes is highlighted.

The profile of Qamata Irrigation Scheme is discussed in Chapter 4. It offers a description of the irrigation scheme and its operations. It discusses the historical synopsis of the scheme, aims and objectives, organisational structure and farm management practices. The functional efficiency of the irrigation technology employed at QIS is examined. The relevant public policies relating to QIS are also discussed.

The research methods are explained in Chapter 5. The methodological framework is clearly spelt out and the merits and demerits of the framework discussed. The chapter also discusses the characteristics of the data solicited, methods of data collection, sample design and methods and statistical models of data analyses and the rationale for their choice.

Chapter 6 discusses the first part of the research findings which provides insights into the social economy of Qamata. The socio-economic factors which reflect the performance of QIS as a rural and agricultural development project are presented and analyzed. The factors include the major characteristics of the people at Qamata, their livelihood practices and strategies and how they meet their basic needs and services.

Chapter 7 presents and analyzes the second part of the research findings that deal with the impact of irrigation technology on farming practices and agricultural production at Qamata. The major characteristics of irrigation and dryland farming and their impact on social development at Qamata are compared and discussed.

The irrigation development and management policies at QIS are analysed vis-à-vis the research findings in Chapter 8. The chapter critically looks at the extent to which the performance of QIS, as revealed in Chapters 6 and 7, is attributed to the fundamental flaws in the development policy, execution strategies and approaches, management practices and institutional support and services.

Chapter 9 presents the key empirical findings, conclusions and recommendations of the study. The recommendations are made with the view to making QIS viable to offer stable and sustainable livelihoods for the rural people at Qamata.

CHAPTER 2

CONCEPTUAL BASIS OF DEVELOPMENT POLICY AND IRRIGATION TECHNOLOGY

2.1 Introduction

This chapter conceptualizes and analyses the role of development policy and irrigation and agricultural technologies in the social and economic development in the former homelands of the Eastern Cape. The discussion is premised on the notion that drought and inadequate rainfall are among the principal causes of rural poverty and food insecurity in the former homelands of the Eastern Cape, and the need to address rural poverty and food insecurity necessitates the transfer of agricultural technologies to the countryside in order to build the capacity of the rural poor to improve their livelihood strategies (Xhosa Development Corporation, 1967:97; TRACOR, 1988:1). The operational definitions offered in this chapter will facilitate the understanding of the significance of public policy, irrigation technology transfer and agricultural development in the struggle against rural poverty, food insecurity and unemployment in the former homelands of the Eastern Cape.

2.2 Development policy

The semi-arid climate of the former homelands of the Eastern Cape poses formidable challenges for the rural communities whose livelihoods depend on agriculture. As discussed in Section 1.1 of Chapter 1, agricultural productivity and food security are both related to access to water which also depends to a great extent on climate variability. The rural communities have therefore traditionally endured high levels of poverty in the province. Access to institutional support and services such as infrastructure, resources, income-generating activities and governmental initiatives (i.e. public policies) improves the capacity of an individual or a group to mitigate the impacts (e.g. poverty, food insecurity and unemployment) of drought and inadequate rainfall. The active implementation of appropriate irrigation technology transfer and agricultural development policies is regarded as an important strategy to build human capacity to extenuate the effects of drought in order to render rural livelihoods viable and sustainable (León and Garay-Flühmann, 2005:3).

The focus of irrigation technology transfer in the rural Eastern Cape has always been the provision of water for cultivation while other equally important issues such as improved techniques of agricultural production and institutional support and services that influence the performance of smallholder irrigation schemes receive secondary attention (Republic of Transkei, 1991:253 and 263). However, León and Garay-Flühmann (2005:3) perceive the institutional arrangements that accompany the supply of irrigation water as an essential component of the irrigation technology transfer strategy because such arrangements build the production capacity of the beneficiaries. The transfer of irrigation technology is thus seen as an integral part of the rural development process especially where the indigenous agrarian technology does not keep pace with increasing need for food and fibre, employment opportunities and better living conditions.

The state has a very definite role to play in the rural development process. In a neo-liberal economy the role is limited to managing the development process, precisely the provision of appropriate institutional framework and arrangements for development to unfold. They include policies, infrastructure and the creation and maintenance of socio-economic climate conducive to development (Swanepoel, 2000:87-94). Development policy sets the development agenda and leads and gives direction to the development process. Irrigation development policy therefore defines public regulations, infrastructure, resources and services that promote irrigation development. Hence development policies are contextual and are not universally applicable. The success of any development programme is a function of the policy that defines the programme. Since development optimizes individuals' opportunities for self-fulfillment appropriate development policies are formulated with the active participation and involvement of beneficiaries (Haines, 2002:50-51; Lund, 1998:1; Chambers, 1983:112).

Where the state commandeers the development process as happened in the former homelands in the Eastern Cape before 1994 (see Chapter 3), popular participation is seriously restricted because people are not allowed to make decisions regarding their own future. Under such circumstances, the development policy that emerges and the programmes that ensue do not reflect the actual needs and capabilities of the beneficiaries and are unlikely to achieve their intended objectives. Development policy takes into consideration all the factors that influence the development process. Development policy determines the environment and framework within which development takes place. It is a reflection of the general strategy a government or regime decides to follow when addressing development problems and issues. Programmes and projects are designed to address specific policy issues such as rural poverty and food insecurity: they are the practical mechanisms for implementing policies (Frimpong, 2003:1-2; Rondinelli, 1993:118-153).

The section that follows defines agricultural technology and its effect on rural and agrarian development n the former homelands in the Eastern Cape.

2.3 Defining agricultural technology

Irrigation farming is one of the forms of agricultural technology that has been transferred to rural communities in the Eastern Cape to build the capacity of local farmers to reduce poverty and food insecurity. Agricultural technology denotes useful knowledge pertaining to the art of agricultural production acquired through technical progress. In its simplest form, agricultural technology may be described as a better way of performing a known farming task or the discovery of how to perform a previously impossible farming task (Rodee, Anderson, Christol and Greene, 1981:339). It involves the knowledge of using tools, machines and systems to perform tasks efficiently. The application of technology in agriculture makes the lives of farmers easier and better and improves their ability to work. Agricultural technology is therefore central in reducing rural poverty and food insecurity (IFAD, 2001:6). Modern agricultural technology enables farmers to produce more and better products. Indeed agricultural technology is a pervasive and intrusive force which constantly shapes the well being of farmers and those who depend on agriculture for livelihood. However, Tripp (2006:4) cautions that “agricultural technology is only one part of the solution to persistent rural poverty, and technology projects must be linked with broader rural development strategies”.

According to the International Fund for Agricultural Development (IFAD) (2001:128) “Poverty is often concentrated in areas where the technology to improve the production of staples has not yet been introduced”. The underlying rationale is that the successful transfer of appropriate technology and know-how to the rural poor ensures efficient utilization of resources and effective application of infrastructure and services in order to enhance the chances of success of rural livelihood strategies. Akubue (2002:33) for example, sums up the causes of the problems that confront the rural poor as gross inadequacies in the application of existing infrastructure to transform the available resources to attain and maintain reasonable living conditions. The missing links in the contemporary rural survival equation are appropriate technology and skill acquisition. Owing to technological poverty, the full potential of the available resources and infrastructure remains untapped (Aryeetey, 1992:29).

Akubue (2002:33) and Aryeetey’s (1992:29) observations are pertinent to agricultural development in the former homelands where most of the farmers farm as their forefathers did, using rudimentary techniques and implements (Lahiff, 1999:14-16). As will be exemplified in Section 7.3 of Chapter 7, the smallholder irrigation farmers at Qamata Irrigation Scheme cannot expand production because of the shortage of tractors for land preparation for planting. Therefore, agriculture provides weak impetus for the development process. Considering the extent of rural poverty, food insecurity and unemployment, Aryeetey (1992:50) advises that “it is rather late for the development of a wholly indigenous form of technology to satisfy the factor and product market … What may therefore be a more plausible approach is the adaptation of foreign designs of machines and implements to suit local conditions, where possible”.

2.4 Technological options in agricultural and rural development

The forms of agricultural technology that are employed to improve agricultural productivity in the commercial farming areas in South Africa include irrigation, biochemical technology (involving the use of fertilizers, insecticides, etc.), mechanization and biotechnology[13]. IFAD (2001:127) argues that these agricultural technologies[14] are generally complementary and an adequate rate of poverty reduction cannot be generated without them. In the commercial farming areas in South Africa the integrated use of biochemical, bio-agricultural and irrigation technologies generates high agricultural output at the farm level; the unit cost of production is thus reduced substantially (Agricultural Research Council, 2006). The development of these technologies for the commercial farming sector has been made possible by the establishment of institutions such as the Agricultural Research Council (ARC)[15]. The commercial farming sector has long benefited from such public policy initiatives and institutional services.

The choice of agricultural technologies in the rural farming communities in the Eastern Cape is limited mainly to irrigation, mechanization and the application of fertilizers, insecticides and conventional hybrids of staples which have a limited range of usefulness (IFAD, 2001:127). The adoption of these forms of agricultural technologies has attracted criticism from development analysts and commentators: the mechanization of draft for instance has reduced employment in the agricultural sector without raising yields; and better land and water management require biotechnology in order to reduce rural poverty (Tripp, 2001:479-481; IFAD, 2001:127-128). The transfer of agricultural technologies to the rural people in the former homelands has been *ad hoc*. The absence of biotechnology policies and central coordinating research

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[13] In 1992 the UN Convention on Biological Diversity defined biotechnology as "any technological application that uses biological systems, living organisms, or derivatives thereof, to make or modify products or processes for specific use" (Economic Commission for Africa, 2002:81). Biotechnology generates crop varieties which produce higher yields with higher nutritional content and are more resistant to drought, pests and micronutrient depletion than conventional hybrids (Economic Commission for Africa, 2002:7).

[14] The alternative is the low external input technology (LEIT) which uses local resources. LEIT has not been popular: its contribution towards the development of sustainable agriculture is marginal because it does not generate enough yield (without the use of fertilizers) to alleviate rural poverty. Besides, its labour requirements are too high (Tripp, 2006:2-3).

[15] ARC was established in 1902 to assist in the development of commercial farming in South Africa (Agricultural Research Council, 2006).

institutions (such as the ARC) in the former homelands meant that the departments of agriculture of the various homelands transferred elements of bio-agricultural technologies that had been specifically developed for commercial farming to subsistence farming communities with little or no extension service (Ministry for Agriculture and Land Affairs, 1998:3.2).

Although the 1995 White Paper on Agriculture (Department of Agriculture, 1995:8.7) acknowledges the deficiencies in the manner in which aspects of bio-agricultural technology are transferred to subsistence farmers in the former homelands, little effort has been made to develop and transfer biotechnology specifically designed to step up the production of local staples to the rural poor (Department of Agriculture, 2007:23). Sustained growth in agricultural production in the former homelands requires the establishment of appropriate policies, institutions and infrastructure to grant the food crop farmers “access to productive assets (such as land), modern inputs (such as improved crop varieties), and credit, technical assistance, and improved farm management practices” (Economic Commission for Africa, 2002:108). The empowerment of rural communities must include better agricultural technologies in support of their labour, land and capital. The local farmers need information about technological options and choices. It is the function of development policy to establish institutions that generate and disseminate farming technologies, especially in poor communities. Irrigation farming in the former homelands of Eastern Cape is undertaken with limited biotechnology, inappropriate policies and inadequate institutional support (Ministry for Agriculture and Land Affairs, 1998:3.2).

Irrigation development presents many challenges for agricultural and rural development in Africa. The section that follows examines the extent to which the experience of the former homelands in the Eastern Cape in irrigation development is comparable with those found elsewhere in Africa.

2.5 Irrigation development in Africa

The period after World War II witnessed increased emphasis on irrigation development in Africa (Harrison, 1987:154; Underhill, 1983). The period was marked by massive investments from international financial institutions and donors such as the International Monetary Fund (IMF) and the World Bank in irrigation development to improve agricultural production in order to boost export to generate foreign exchange especially in sub-Saharan Africa. The irrigation projects which were developed were large-scale state sponsored irrigation schemes. They were designed mainly for the production of cash crops such as cotton on the Gezira Plains in Sudan and at the Rahad Scheme in Egypt, coffee in Machakos District in Kenya, groundnuts in the Gambia and sugar cane at the Vuvulane and Dawhenya irrigation schemes in Swaziland and Ghana respectively. In stark contrast the irrigation schemes in the former homelands of the Eastern Cape were specifically planned and implemented in response to the need to mitigate the problems of rural poverty, destitution and food insecurity which were the socio-economic manifestations of the impact of the policy of separate development in South Africa (see Section 3.5 of Chapter 3).

The large-scale state sponsored irrigation projects in Africa were established to exploit the economies of large-scale farm mechanization. The management and administration of the irrigation schemes are centralised in a bureaucratic corporation: decisions regarding crops to grow, timing of farm operations and inputs to use are centrally taken by the management of the schemes and the tenant farmers are obliged to comply or face eviction or fines (Harrison, 1987:172). Besides, the management offers guaranteed market at predetermined prices for the entire output of the tenant farmers. Harrison (1987:156) and Bembridge (1986a:104) blame centralization of power and decision-making for the failure of the schemes to accomplish their objectives as essential services (e.g. ploughing and weeding) and supplies are often delayed. These characteristics (i.e. centralization of power and decision and policy making and the consequent failure) of irrigation development in Africa bear a close resemblance with those of the irrigation schemes in the former homelands of the Eastern Cape (see Section 4.3 of Chapter 4).

On the continent of Africa as a whole, there has been a dramatic decline in investments in irrigation development since the 1980s which Ruotsi (1995), among others, attributes to the growing concern of environmental stability, rising costs of construction and more importantly to the disillusionment in international financial and donor circles with irrigation performance in Africa. The contribution of irrigation schemes to the total agricultural production has been modest. The enthusiasm and optimism that initially characterised irrigation development in Africa have dissipated and have been replaced by a more cautious approach based on the evaluation of irrigation prospects.

Irrigation development has achieved mixed successes on the continent. However many contemporary commentators tend to stress on the failure of irrigation projects as they are dismayed by the performance of irrigation schemes in Africa. Ball (1986:342) for example describes the development of irrigation schemes in Africa as “an unblemished record of failure”. Vaughan (1997:8) perceives irrigation schemes in the former homelands of South Africa as “unmitigated disasters”. The Department of Water Affairs and Forestry (DWAF) and Department of Agriculture (DoA) (1996:4), argue that “for all practical purposes the [irrigation] schemes [in the former homelands] have failed, resulting in hardship with economic and practical implications”. Irrigation development in Africa has been problematic because economic and social output of irrigation projects is often lower than what is estimated at the planning stage (da Silva, Park, Keatinge and Pinto, 2001:188).

The productivity of irrigation schemes in Africa has generally been marginal (FAO, 2005:2-4; Bembridge, 1986b:600; Groenewald, 1986:667). The contention is that the contribution of irrigation schemes towards food production is insignificant because irrigation development has failed to bolster agricultural production meaningfully. Groenewald (1986:667) argues that irrigation has failed to provide the necessary insurance against erratic rainfall in Africa and cannot stabilise agricultural production. According to FAO (2005:2) the productivity of irrigation agriculture in Asia far exceeds the level of productivity irrigation farming achieves in Africa. The major problem that irrigation development in Africa faces lies in the organisational approach which neither builds the technical capacity of the participating communities nor introduces appropriate technologies based on the use of local resources and expertise (Harrison, 1987:156).

Some analysts however are convinced that investment in irrigation development in Africa makes economic sense (Reij and Steeds 2003:v;

Tiffen, Mortimore and Gichuki, 1994:311). The outcomes of recent long term studies by Reij and Steeds (2003) between 1980 and 2002 in West Africa and Tiffen, Mortimore and Gichuki (1994) in East Africa between 1930 and 1990 give credence to the above contention. For example, the findings of Reij and Steeds (2003:3) in the Central Plateau of Burkina Faso and Keita Valley in Niger show that:

(i) crop yields (mainly local staples) increased by 50%;
(ii) intensive cultivation has reduced the pressure on natural resources and the natural vegetation is improving;
(iii) greater amount of forage is available for livestock due to local regeneration of vegetation;
(iv) the rate of rural-urban migration has reduced;
(v) the organisational capacity of the farmers has increased; and,
(vi) rural poverty and food insecurity have been reduced up to 50%.

Similar observations have been made by Tiffen *et al* (1994) in Machakos District in Kenya. According to Reij and Steeds (2003:22-23), the success of these irrigation projects in Africa lies in the building and strengthening of capacities and delegation of responsibilities to users' associations.

2.5.1 The success of irrigation schemes in Africa

The success of irrigation schemes is determined by the extent to which they realize their stated objectives. From the above discussion, the success of irrigation schemes in Africa may be determined from two perspectives. Where the irrigation projects were designed to augment the production of cash crops, the irrigation schemes may be deemed to have been successful if their contribution really results in substantial increases in cash crop yields, and generates sustained returns to cover the costs of construction of the schemes and their operation and maintenance costs (Harrison, 1987:154; Underhill, 1983). Such irrigation schemes were planned as economic enterprises, for example, the Mwea Irrigation Scheme in Kenya (Clayton, 1983:178). Clayton (1983:196) argues that the Mwea Irrigation Scheme has been successful because it produces high rice yields and makes a substantial contribution towards domestic requirements; besides, the net farm incomes are high and the scheme covers its operation and maintenance costs. Where irrigation projects were set up to accomplish social goals, the success of the irrigation schemes may be determined in terms of their contribution towards employment creation, poverty alleviation, rural depopulation, access to resources and services and inequality in the distribution of incomes and assets (Harrison, 1987:154; Underhill, 1983). The irrigation schemes in the former homelands of Eastern Cape and those schemes evaluated in Burkina Faso and Niger by Reij and Steeds (2003) are examples of irrigations schemes planned to meet specified social objectives. As will be discussed in Section 8.2 of Chapter 8, in reality, the objectives of irrigation schemes are not as simple as stated above. Denison and Manona (2007:57) contend that the objectives are usually premised on both social and economic considerations, making it difficult for the schemes to achieve their intended objectives.

Reij and Steeds (2003:22-23) and Bembridge (1986b:118) regard institutional and organisational problems (ranging from development policy formulation to marketing facilities) as the key constraints to the improvement of irrigation performance in Africa. Institutional and organisational constraints affect virtually every important aspect of irrigation development; they are usually the consequence of the over centralization of power and management which reduces the chances of public-private partnerships which are essential for service provision and capital formation (Reij and Steeds, 2003:22-23).

2.6 Irrigation policy in post-apartheid South Africa

The post-apartheid irrigation policy in South Africa is not contained in a single document but in the National Water Act 36 of 1998 and White Papers and publications of DWAF and DoA. The old Water Act 54 of 1956 granted unequal access to water and land resources and institutional support and services. The need to correct the inherent weaknesses of the Act in post-apartheid South Africa demanded that the national policy on water use and the water law be revised. The objectives of the policy revision include, among others, the creation of opportunities for the resource-poor farmers to reduce rural poverty and improvement in resource utilization to ensure sustainability of small scale agriculture. The process of initiating a new irrigation policy commenced with the publication of a discussion paper in 1995 by the DWAF

(DWAF, 1995). The discussion paper was followed by the publication entitled 'Towards an Irrigation Policy for South Africa' jointly published by the DWAF and DoA in 1996. The two publications provided the context for setting out new policy options. In 1997 the White Paper on a National Water Policy for South Africa was published and the National Water Act (Act No. 36 of 1998) was eventually promulgated in 1998.

The DWAF and DoA are jointly responsible for irrigation and irrigation development in South Africa. It is the responsibility of DWAF to develop the national water infrastructure and allocate and control water resources while DoA develops national water strategies and institutional arrangements such as extension services, conservation and marketing. The Provincial Departments of Agriculture are charged with the function of supporting and developing irrigation farming. The National Water Act has far reaching implications for smallholder irrigation farming. It guarantees equal access to water for disadvantaged groups for productive purposes such as irrigation farming. The permission to use water is granted for a given period to be determined by the Water Users Association (WUAs). In order to promote the efficient use of water users are charged for the full financial costs of providing access to water. However in disadvantaged communities water charges of the poor people who cannot afford to pay are waived for a given period to promote equitable access to water for productive purposes. This provision is particularly helpful in poor rural communities where water is an essential resource for poverty alleviation through smallholder irrigation farming.

The core concept of water management under the National Water Act is decentralization. The Act has established new water management entities, Catchment Management Agencies (CMAs) and WUAs to manage water resources at regional and local levels respectively (see Section 4.3.6 of Chapter 4). The creation of WUAs gives an impetus to irrigation management transfer (IMT) because at the community level smallholder irrigation farmers are empowered to pool their resources together to manage and allocate water resources in a sustainable fashion according to local needs and circumstances (Perret, 2001:7). Commenting on the establishment of CMAs and WUAs as expressed by the White Paper on a National Water Policy for South Africa, Vaughan (1997:16) notes that the "new institutional framework for water management and allocation will facilitate development through creating spaces for the representation and self-development of small scale irrigators". However, the National Water Act abolishes the riparian system of water allocation in which the right to use water was linked to the ownership of land along rivers.

The National Water Act exhibits some inherent weaknesses. Vaughan (1997:13) argues that the time limit on the right to use water restricts investments in irrigation development and the abolition of riparian rights impacts negatively on land values. Perret (2001:10-11) fears that the concept of water rights as contained in the National Water Act provides a framework for water markets to flourish where smallholder irrigation farmers could sell their water rights to commercial farmers and mining concerns. The provision thus threatens smallholder irrigation development.

The 1995 White Paper on Agriculture (Department of Agriculture, 1995) provides for institutional support and services for agricultural development in disadvantaged communities. This provision is important to the development of smallholder irrigation farming because institutional support and services, *inter alia*, are important factors that influence the uptake of irrigation schemes (see Section 7.9.2 of Chapter 7). The White Paper therefore stresses the need to assure equitable access to institutional services, especially appropriate land tenure, credit, market, extension service and capacity building, to ensure food security in resource-poor communities. It proposes that government and parastatal services to farmers must be determined by needs in order to be appropriate and efficient.

The 1995 White Paper recognizes the importance of capacity building in the agricultural sector because the lack of skills prevents farmers from employing the available resources and infrastructure effectively to reduce poverty, food insecurity and unemployment. It advises that agricultural production, marketing and financial management by farmers should be improved through extension service and training. The development of effective cooperatives is perceived as essential to enhance the capacity of farm workers, farmers and other rural dwellers to ensure that they have a say in the formulation of policy that affects them. It encourages the development of new farming systems and appropriate technologies to meet the needs of small-scale farmers. It proposes that research programmes and technology development be planned in collaboration with farmers. The provisions of the 1995 White Paper on Agriculture are pertinent to smallholder irrigation development in the former homelands in the Eastern Cape. As will be noted in Section 4.3.6 of Chapter 4, the capacity building component is particularly important to the concept of irrigation management transfer because the WUAs will be empowered to execute their legal functions and responsibilities efficiently.

The post-apartheid irrigation policy seeks to “improve efficiency, develop criteria to be applied in the development of new irrigation capacity, which will address the inequalities resulting from past policies, and open up irrigation possibilities to new farmers, provide for self-management of irrigation schemes and provide for training and extension” (Department of Agriculture, 1995:65). Notwithstanding the policy changes since 1994, institutional reforms do not go far enough to generate the necessary impetus for increased productivity. For example, land tenure arrangements at the smallholder irrigation schemes remain unchanged and the resource-poor farmers’ access to inputs, credit and market and training facilities is virtually non-existent. What is conspicuously absent in the post-apartheid irrigation policy documents is a systematic plan to transfer irrigation technology to smallholder irrigators (see Section 3.8 of Chapter 3) although the 1995 White Paper on Agriculture (Department of Agriculture,1995) acknowledges the important roles technical and management expertise play in smallholder irrigation development in impoverished rural communities.

The post-apartheid irrigation development policy itself is not easily accessible because it occurs in bits and pieces in different official documents and publications. The policy measures and procedures that have so far been enacted to guide smallholder irrigation development “represent little more than a very preliminary move towards [irrigation] policy formulation” (Vaughan, 1997:16). Hence the contention is that South Africa does not have any formal irrigation policy to shape irrigation development and the transfer of irrigation technology to the rural people.

2.7 Irrigation technology transfer

Although the transfer of irrigation technology into the rural areas in the semi-arid regions of South Africa is fundamental to improvements in agricultural productivity and living conditions the country lacks an official policy for irrigation technology transfer *per se*. Important issues pertaining to the transfer of irrigation technology occur in patches in official documents. The Department of Agriculture (2007:19) identifies two aspects of technology change that are associated with the introduction of irrigation farming in rural communities. The first involves the transfer of irrigation technology by public policy initiatives to the participating groups of farmers in the irrigation schemes, and the second is the diffusion of the technology from the irrigation schemes to the wider rural economies. Ideally it is expected that in both cases the recipients are able to employ, improve on and probably disseminate the technology farther afield (see Section 8.8.1 of Chapter 8). The transfer of irrigation technology in the Eastern Cape via public policy has traditionally been a top-down development process sponsored by the government. The success of the top-down transfer of irrigation technology depends on efficient and effective extension service. The transfer of agricultural technology in South Africa is guided by a generic policy, *Norms and Standards for Extension and Advisory Services* (Department of Agriculture, 2008; Didiza, 2005).

The Norms and Standards for Extension and Advisory Services policy specifies the prerequisites for effective service delivery geared towards improving agricultural productivity, particularly among resource poor farmers. The policy focuses on creating an enabling environment for increased and sustainable agricultural production; and promoting sound management and use of land and water resources through appropriate policies, norms and standards and technical guidelines. Besides setting the framework for the monitoring and evaluation of performance of extension services, the policy prescribes a bachelor's degree qualification as the minimum entry qualification for extension workers and advisory staff (Department of Agriculture, 2008). This provision will have an important implication for irrigation technology transfer and agricultural development in the rural communities (see Section 7.8 of Chapter 7). The participatory approach in which irrigation technology diffuses from the irrigation schemes to the wider rural communities through farmer-to-farmer learning is regarded as a more appropriate option because participants identify and select the technologies that are suitable to their needs and eventually become self-reliant (Department of Agriculture, 2007:19).

The transfer of irrigation technology should involve a greater proportion of rural households to ensure equitable development. However, as will be illustrated in Section 8.3.3 of Chapter 8, inequalities exist between the earnings of irrigation and dryland farmers at Qamata. The coexistence of affluence and poverty undermines social stability and contradicts the purpose of development (Seers, 1977:3). Besides, it should aim at building the capacity of the participating communities to “avoid the creation and maintenance of dependency” (Department of Agriculture, 2007:19).

Economic efficiency is an important factor which influences farmers’ decisions to adopt irrigation technologies. The target farmers need to know the technical and economic merits of the irrigation technology. In addition, the assimilative capacity of the end users is important. However, “awareness and knowledge does not guarantee adoption unless the technology is made accessible to the target farmers through institutional systems such as credit provision and subsidies” (Namara, Upadhyay and Nagar, 2006:6). As will be discussed in Section 7.3 of Chapter 7, inadequate institutional support and endemic poverty hinder the full adoption and application of the modern agricultural technology and methods of production by the smallholder irrigation farmers at Qamata.

The technology for harvesting and conveying water to cultivated fields determines the rate at which irrigation technology can proliferate in the rural communities. In the former homelands in the Eastern Cape, the transfer of irrigation technology involves the construction of large storage dams (e.g. Lubisi Dam, Figure 1.4) and dense networks of canals and lei dams which require huge initial capital outlays. Irrigation schemes are thus not easily replicated. Consequently, there are few irrigation schemes in the province.

The use of micro-irrigation in the form of earth dams with low cost treadle pumps has the potential to increase participation of the rural poor in irrigation agriculture. Micro-irrigation dams are owned and controlled by individual households. Their attractiveness lies in the potential to increase food security and income and generate employment opportunities (Mangisoni, 2006:2). Micro-irrigation technology is easily and effectively transferred via the farmer-to-farmer learning approach.

2.8 Prerequisites for successful irrigation development

Some development analysts hold the opinion that irrigation is not a necessity in the former homelands in the Eastern Cape because the region's experience with irrigation has been mixed (Vaughan, 1997:9). Many irrigation projects, notably large irrigation schemes operated and maintained by government agencies and parastatals, have performed poorly as they have failed to achieve their intended goals and targets at considerable cost (Tortajada, 1998:2; Wyss, 1990:1). Since irrigation is regarded as a panacea for the problems of drought and floods, most often issues of sustainability, justification and local adaptability are relegated to the background during the planning and implementation phases (Moris, 1987:100). Vaughan (1997:9), for example, identifies "unaccountable and fragmented support systems and inappropriate institutional arrangements" as some of the major characteristics of large irrigation schemes in the former Bantustans. Irrigation has therefore had limited success.

Given this scenario, some eminent authorities in irrigation farming are of the opinion that certain preconditions have to be met before investments in irrigation can achieve success (Moris and Thom, 1990:33; Wyss, 1990:2-4; Bembridge, 1984:348-349). The critical preconditions identified include the following:

(i) detailed planning, reflecting the interests of all stakeholders[16] and the fragile environment. As will be discussed in Section 7.7 of Chapter 7, soil erosion is a major environmental problem associated with farming methods at Qamata. The irrigation projects that are planned and

[16] Stakeholders are individuals or groups of people with vested interest in a particular irrigation scheme and are directly or indirectly affected by the scheme.

executed with little attention to environmental stability have, in most instances, resulted in reduced economic benefits at significant social and environmental costs (Tortajada, 1998:2; Elahl and Khushalani, 1990:73);

(ii) the majority of the people in the targeted community should possess enough material resources to invest in agriculture (Elahl and Khushalani, 1990:74). In the case of QIS inadequate access to resources such as tractors results in poor crop yields (see Section 7.3 of Chapter 7);

(iii) appropriate land tenure arrangements to permit the creation of profitable productive units (Tafesse, 2003:48). For example, at QIS inappropriate tenurial arrangements have resulted in widespread subsistence farming (see Section 8.3 of Chapter 8);

(iv) the farmers should know the techniques of irrigation farming: their cooperation and willingness to accept advice and instructions from extension officers and water controllers are essential (Bembridge, 1984:348). As will be noted in Section 7.9.3 of Chapter 7, capacity building of end users is essential for the uptake of QIS;

(v) sound public policies for establishing a conducive environment for the participation of smallholder farmers (Wyss, 1990:3). At Qamata for instance, the exclusion of the people from participating in the initial irrigation development processes has bred passivity in the ranks of the smallholder irrigators at QIS (see Section 7.9.1 of Chapter 7);

(vi) adequate institutional capacity to manage irrigation projects (Perret and Touchain, 2002:7-8). In the case of QIS inappropriate institutional support has created dependent farmers who are not prepared to accept risks (see Section 8.10 of Chapter 8); and,

(vii) the technology must be appropriate to suit local conditions and resources (Elahl and Khushalani, 1990:73-74). As will be noted in Section 7.3 of Chapter 7, the locally available resources (e.g. animal draft power and manure) do not suit the technique of farming that came with irrigation technology at QIS.

Prior to 1994 local farmers did not have any say in the formulation, planning, design and management of irrigation projects. Both government and donor agencies hardly regarded the farmers as partners in irrigation development and farmers were often denied the right of participation. Even where a commitment to grassroots participation existed, the poorest and the least powerful sector of the community, especially women, were often excluded. However, women provide most of the farm labour and are therefore very important to successful smallholder irrigation development (Chancellor, 1997:1; Ezeh and Okoli, 1995: Chapter 24).

2.9 Constraints to irrigation farming

The factors that prevent the uptake of the irrigation schemes in the former homelands of Eastern Cape are grouped into three main categories, namely, policy and institutional support, capacity of human capital and environmental factors.

2.9.1 The role of public policy and institutional support

The former Bantustan administrations in the Eastern Cape lacked the capacity to formulate appropriate and sound socio-economic policies to establish sustainable smallholder irrigation projects. The planning authorities, therefore, contracted Loxton, Venn and Associates to perform the all-important function of development policy formulation (Van Averbeke *et al*, 1998:9). The consultants mostly mimicked policies formulated for Vuvuland Irrigation Scheme in Swaziland (Republic of Transkei, 1978:96) or simply scaled down the policies originally formulated for commercial farming in South Africa (IPTRID, 2000:11; Southall, 1983:222). The effects of the policies were manifested in infrastructure deficiencies owing to inappropriate planning and design, poor operational management setup, inadequate expertise on the part of the beneficiaries and extension agents and advisors, lack of grassroots participation and involvement and inadequate institutional structures such as extension service, land tenure arrangements and subsidies for inputs (Perret, 2001:5). Therefore, the production of most of the irrigation farmers could not expand beyond subsistence level, thereby rendering irrigation farming unprofitable and unsustainable (see Section 7.3 of Chapter 7).

The tenurial arrangement that prevails in the smallholder irrigation schemes in the former homelands is mostly based on communal land ownership (Perret, 2001:4). What this means is that the uninterested farmers cannot sell their holdings to capable farmers to stimulate large-scale irrigation farming. Moreover the irrigated holdings cannot be pledged as collateral to secure credit. At QIS for instance, the size of irrigated plots allocated to the food crop farmers is too small to provide subsistence for their households (see Section 4.3.1 of Chapter 4). The farmers are induced to depend on other sources to earn livelihood and limited time and resources are consequently committed to irrigation farming. Most often, the male irrigators migrate to urban centres to look for employment.

After 1994 the provincial government in the Eastern Cape instituted irrigation rehabilitation and management transfer programmes to reduce the financial burden posed by the smallholder irrigation schemes in the province. Meanwhile the policy focus of the National Department of Agriculture (NDA) shifted to the promotion of small-scale commercial farming (Perret, 2001:15). Furthermore, the contemporary rural development polices, viz the Integrated Development Planning (IDP) and the Local Economic Development (LED) strategies of both local and district municipalities, do not directly prioritize smallholder irrigation farming: they are primarily concerned with the development of infrastructure such as housing, roads and recreational facilities in the rural areas to attract businesses in the tourist industry. The subsistence irrigators thus lack the capacity to step up production on their own to ensure sustainability of irrigation farming because the previous irrigation development and management policies did not lay the necessary foundation for irrigation management transfer (IMT).

2.9.2 Capacity of human capital

The extent to which irrigation farming contributes to productivity increases is a function of educational standards and literacy levels of both beneficiaries and extension staff (Department of Agriculture, 2007:15). The irrigation schemes in the former homelands in the Eastern Cape are located in rural areas where the levels of education and skills of both the farmers and extension workers are equally low. Owing to the inherent deficiencies in the irrigation policies and the institutional support and services that ensued, the essential skills of irrigation farming could not be imparted to the local farmers (Perret and Touchain, 2002:7-8; Backeberg, 2005:14). The farmers cannot therefore efficiently utilize the resources and techniques of production that come with irrigation farming to improve productivity. The kind of adult education established at the irrigation schemes did not prepare the farmers for roles in irrigation and water management. Besides, the extension workers in the homelands were not accountable to the farmers and lacked focus and clear targets (Ministry of Agriculture and Land Affairs, 1998:3.2). The lack of expertise prevented the stakeholders from carrying out the basic and crucial operations and maintenance tasks. Backeberg (2005:14) argues that even under the new political system of governance, many extension officers in the former homelands lack the necessary knowledge and skills in irrigation management, and are consequently not in a position to render an effective service to farmers.

The economic base of the majority of the local irrigation farmers is weak because of endemic poverty as a result of low agricultural productivity which is also partly due to the effects of inadequate skills and expertise. However the relative development costs of irrigation farming are high. In the absence of effective institutional support and services, the farmers cannot procure the essential resources and inputs to step up production beyond subsistence level (Tafesse, 2003:3).

2.9.3 Environmental factors

Land degradation poses serious threats to the sustainability of irrigation farming in the former homelands. It is a result of both the fragile physical conditions (as discussed in Section 1.5 of Chapter 1) and poor land management (Economic Commission for Africa, 2005:140). The sparse vegetation cover allows run off to erode the land which eventually causes the canals to collapse. The scarcity and poor quality of water are related to concentration of sediments in dams and canals. The problems are aggravated by poor operation and maintenance activities which result in water wastage and inundation of large tracts of irrigated fields. At the time the irrigation schemes in the former homelands were established environmental issues were not given a priority in agricultural and rural development (Mather, 1996:41).

The extent to which land is improved and managed for agricultural and rural development is influenced by the security of tenure. The economic Commission for Africa (2005:140) argues that tenurial security "provides incentives for investment in agriculture and natural resources, thereby contributing to increased and sustained agricultural productivity and natural resource stewardship". Environmental degradation which decreases the productivity of the land at the irrigation schemes in the former homelands is thus partly blamed on communal landownership with insecure tenure (Perret, 2001:4; Vaughan, 1997:8). The impression one gets from the above discussion is that the basic preconditions for the uptake of the irrigation schemes in the former homelands were not met. The role of consultants and their contribution in irrigation development in the former homelands in the Eastern Cape will be discussed in the section that follows. The intention is to locate the likely source of the problem (i.e. inappropriate irrigation development policies) that bedevils smallholder irrigation schemes in the province.

2.10 Irrigation and agricultural development consultants

The former Bantustans in the Eastern Cape relied on outside development consultancy firms to initiate rural and agricultural development programmes and projects as the territories faced a dearth of technical expertise (Holbrook, 1992:177). The shortage of skills in the fields of engineering, irrigation and agricultural development in the former homelands is the manifestation of the long term effects of colonial and apartheid policies (see Section 3.3.1 of Chapter 3). The firms consisted of groups of specialists who were well known in southern Africa especially in the field of irrigation development. Their involvement in irrigation and agricultural development meant that they played a significant role in the distribution of resources as they drafted the development policies for many irrigation schemes including Qamata and

Ncora irrigation schemes in the former Transkei and Zanyokwe and Tyefu schemes in the former Ciskei (Ntsonto, 2005:31; Republic of Transkei, 1978). The transnational irrigation development consultancy firms which operated in the former homelands of the Eastern Cape included Agric-Carmel and Loxton, Venn and Associates; however the latter planned and implemented most of the irrigation schemes in the former Transkei and Ciskei.

Loxton, Venn and Associates worked for many years on a contractual basis in the sub region as the Bantustan authorities invested heavily in irrigation development to revamp their rural economies. The ‘freedom’ of choice of technology and the responsibility to develop the major irrigation schemes in the former homelands of Transkei and Ciskei were entrusted to Loxton, Venn and Associates (Republic of Transkei, 1978). The lack of information and expertise meant that the homeland administrations had little choice or incentive to look further than the ‘off the shelf’ irrigation technology suggested to them by the development consultants. As a profit making enterprise, the consultants selected the kind of technology which could possibly offer them maximum fee, namely capital-intensive techniques of agricultural production in unemployment ridden rural setting. The fee Loxton, Venn and Associates charged depended on the total value of investment (Van Averbeke *et al*, 1998:9). The main concern with the acquisition of technology in the Third World has always been with the role, often negative, of transnational enterprises in the transfer of technology (Rush, 1981:165).

The irrigation projects planned and implemented by Loxton, Venn and Associated bear striking similarities. For all the irrigation schemes the firm designed, it prescribed a capital intensive and technologically advanced system of agricultural production, creating the need for external managing consultants. In all cases, it recommended a subsidiary enterprise, Inter-Science (Pty) Ltd managing consultants (Van Averbeke *et al*, 1998:9). The irrigation schemes characteristically consisted of two sections, an estate farm constituting 75% to 90% of the total irrigated land which was centrally managed by consultants and the remainder was assigned to smallholder food crop farmers (Van Averbeke *et al*, 1998:4). At Qamata and Ncora a third component, commercial farming units for local entrepreneurs, was added. The irrigation development plans were based on in-depth assessments of the physical environment (soil and water), farming needs and techniques, engineering requirements and market survey and analysis. Little attention was paid to the local communities in which the irrigation schemes were located (Backeberg, Bembridge, Bennie, Groenewald, Hammes, Pullen and Thompson, 1996:59). Hence, the requirements (skills and expertise) of the local farmers to participate fully in irrigation farming could not be established and planned for (see Section 8.4 of Chapter 8). The experience from India shows that community participation in the design and construction of smallholder irrigation schemes generates the sense of ownership. Besides, the involvement of local communities offers an opportunity to consider agricultural solutions preferred by local farmers (Van Averbeke *et al*, 1998:23-24).

In practice, the irrigation schemes developed in Transkei and Ciskei as prescribed by Loxton, Venn and Associates' ideology proved to be unsustainable. Within the first few years of their establishment, the irrigation schemes performed reasonably well in terms of volumes of production and the need for fiscal support from the state (Van Averbeke *et al*, 1998:4). However, they showed a general decline in the late 1980s and the state had to provide huge annual subsidies to cover operation and maintenance costs. In response to the financial problems, the engagement of managing consultants was terminated in the 1986 and their functions and responsibilities transferred to the Transkei Agricultural Corporation (TRACOR) in Transkei and the Ciskei Agricultural Corporation (ULIMOCOR) in Ciskei. By the early 1990s, financial and structural problems had almost ground the operations of most irrigation schemes in the province to a complete halt. In 1996 the Eastern Cape Provincial Government, in consultation with the national Department of Agriculture and Land Affairs, developed a new policy in which the schemes were transferred to the recipient communities and participating land right holders and farmers, and the government's direct involvement and financial support were withdrawn (TCOE/Eastern Cape Cluster, 1999:2).

2.11 Irrigation management transfer (IMT)

The remarkable feature of irrigation schemes in the former homelands in South Africa since 1994 is the widespread transfer of state sponsored smallholder irrigation schemes to the management of participating farmers. Irrigation management transfer is often referred to as government disengagement or simply as self-management because it commenced with the withdrawal of direct financial support from the government, the curtailment of management functions of parastatals and the transfer of the operation and maintenance costs to the farmers (Perret, 2001:5; Van Averbeke *et al*, 1998:4). Under parastatal management irrigation farming was capital-intensive and the farmers did not make any entrepreneurial or managerial decisions. Besides, agricultural production inputs and equipment were heavily subsidized. In the former Transkei and Ciskei, for example, TRACOR and ULIMOCOR respectively managed state sponsored smallholder irrigation schemes between the second half of 1980s and 1994 through an elaborate top-down command and support system, which eventually proved unsustainable (Shah, van Koppen, Merrey, de Lange and Samad, 2000:40).

The management of smallholder irrigation schemes by parastatals left behind in the former homelands a legacy of impoverishment and dependency (Shah *et al*, 2000:40). The practice destroyed all preexisting informal farming institutions and robbed the farmers of their enterprising and elementary skills to manage agricultural production. Hence the sudden withdrawal of the management functions of parastatals had disastrous consequences on the production capacity of the smallholder irrigation schemes: output dropped sharply in less than a year (Shah *et al*, 2000:40). The smallholder irrigators could not by themselves raise the working capital needed to hire tractors, purchase seeds and fertilizers, and procure specialized services. Capital was previously arranged by the parastatals; their withdrawal created a huge institutional vacuum. The irrigation schemes are located in remote rural areas therefore the linkages of the farmers with sources of credit situated in towns and cities are poor. Similarly, the withdrawal of parastatals meant that the smallholder irrigators lost access to ready markets for their produce. Under the previous arrangements, the parastatals bought their entire produce at guaranteed market related prices.

Several reasons have been advanced to justify the transfer of irrigation management to the participating farmers and communities. The proponents of the idea cite the need to rid the government of huge financial burden. The management of irrigation schemes requires substantial financial resources to employ expertise and procure resources and equipment (Vermillion, 1997:1; Sam-Amoah and Gowing, 2001:23-25). The approach of IMT is compatible with the macro-economic policy in post-apartheid South Africa, the Growth, Employment and Redistribution (GEAR) because the two strategies seek to reduce government expenditure (see Section 3.8 of Chapter 3). Moreover, excessive bureaucratic procedures of government agents and parastatals do not offer incentives for effective management of irrigation schemes to ensure their sustainability (Vermillion, 1997:1; Republic of Transkei, 1978:5). Secondly, it is argued that the need to enhance efficiency, productivity and maintenance of irrigation schemes demands that the beneficiaries should manage irrigation facilities as well as production. As Vermillion (1997:1) explains "… farmers have a direct interest in enhancing and sustaining the quality and cost-efficiency of irrigation management. When given the authority and incentives to act collectively, farmers will act to contain the cost of water management while improving the operational performance because it is in their interest to do so". Finally the objective of collective management of irrigation facilities by a group of farmers is to promote democracy and a spirit of self-reliance and cooperation at grassroots.

The results of experiments with IMT on state sponsored irrigation schemes in 'white' areas in South Africa have proved that the moribund smallholder irrigation schemes can be very remunerative (Shah *et al*, 2000:43). IMT succeeded in the 'white' areas because the farmers have long participated in irrigation management. The outcome of the experiments with IMT indicates that four conditions must be met before an IMT intervention can be successful in the former homelands:

(i) a review of tenurial arrangements at the smallholder irrigation schemes with a view to introducing a system of private land ownership;
(ii) the holdings should be increased to make irrigation farming viable and sustainable;
(iii) introduction of an organizational design that has low transaction cost and institutional reforms that can move the irrigation farmers into a higher trajectory of production and income (e.g. access to extension service, training and capacity building, market and credit facilities and inputs);

(iv) a total rehabilitation and maintenance of the abandoned irrigation infrastructure (Backeberg *et al*, 1996).

The implementation of IMT in South Africa takes place alongside with the implementation of the National Water Act 36 of 1998. The ownership, management and maintenance of the irrigation schemes are effectively transferred to irrigation farmers via the Water Users Associations (WUAs) by the National Water Act. The WUAs operate at the local level as water management institutions. They are in reality "cooperatives associations of individual water users who wish to undertake water-related activities for their mutual benefit" (Maritz, n.d.:6). The National Water Act thus sets the course for smallholder irrigation development.

With the introduction of structural adjustment programmes (SAPs) in the 1980s by the World Bank, many governments in the Third World countries of Africa, Asia and Latin America have come under increasing pressure to transfer the responsibility for the management of smallholder irrigation schemes to participating farmer groups. Vermillion (1997:v) cautions that irrigation management transfer is a relatively new concept and there is a paucity of data to provide an accurate picture of its impacts and policy implications.

2.12 Summary

The transfer of irrigation technology into the rural economies of the former homelands in the Eastern Cape is an essential part of the rural development process. The majority of the rural people depend on agriculture for their livelihood. However, the traditional agrarian techniques of production cannot meet the demand for increased food production and job opportunities because of recurrent drought and inadequate rainfall. Besides, the indigenous agricultural technology has not developed sufficiently to meet contemporary challenges such as new pests and diseases, changes in soil fertility and population growth. In the face of pressure of time, it is prudent to import existing modern agricultural technology to aid agricultural and rural development (Aryeetey, 1992:50).

Owing to the paucity of expertise, only one aspect of modern agricultural technology was prioritized in the former homelands, namely irrigation development. Under the homeland systems of governance, the target population was excluded from the irrigation development policy-making processes. Instead consultants, notably Loxton, Venn and Associates were entrusted with the responsibilities of drafting the development policies and executing the programmes that ensued. The policies over-emphasized technical issues and completely neglected human and other social aspects of irrigation development. Eventually the organisational framework and infrastructure that were created did not suit the farming needs of the beneficiaries. Since similar policies were applied throughout the sub region, the irrigation projects in the former homelands could not alleviate the problems of rural poverty, food insecurity and unemployment. The development policy and programmes failed to develop industrious and self-reliant farming communities. The concept of irrigation management transfer that has dominated irrigation development in the Eastern Cape seeks to transfer the ownership and management of the irrigation schemes to the farmers and relief the government of financial burden.

In post-apartheid South Africa, irrigation development policy has been revised to grant equal access to resources to ensure equitable development. However the prospects of uptake of irrigation development are quite bleak as institutional arrangements have not yet fully been reformed, especially tenurial arrangements at the irrigation schemes and capacity building of the farmers. Besides, the post-apartheid irrigation development policy is not fully developed as it exists in pieces in different official documents restricting complete accessibility.

The next chapter discusses the major policies which shaped rural livelihoods, development processes and the acquisition of irrigation technology in the former homelands of Eastern Cape. The chapter seeks to explore the nexus between past and contemporary public policies and the current levels of development in the black rural areas.

CHAPTER 3

THE CRITICAL NEXUS: PUBLIC POLICIES AND RURAL POVERTY IN THE FORMER HOMELANDS

3.1 Introduction

This chapter discusses the major public policies which retarded socio-economic development, especially agriculture, and necessitated the transfer of irrigation technology to mitigate rural poverty and food insecurity in the former homelands of the Eastern Cape. My discussion is deliberately selective for the purpose of highlighting the policies which so pauperised the people in the peripheral areas that they could not benefit from later irrigation intervention projects.

It is impossible to understand the development challenges the peripheral areas in the Eastern Cape face without some reference to contextual clues. Public policies enacted before 1994 shaped the social structures and economic patterns in the rural areas. The assessment of the rural problem and any effort to redress it must therefore acknowledge the weight of political economy. The approach of this study therefore acknowledges and analyzes the realities of the concentration of wealth and power, differential access to markets and resources, the impact of discriminatory policies and practices, and the complexity of the factors which shape human action in the former homelands in the Eastern Cape.

Some contemporary interpretations of South Africa's past have tended to be somewhat perfunctory in their perception of the social economy of the rural areas because they largely overlooked the role and importance of political power and power relations (Bundy, 1972:369-371). As a result the precariousness of the prevailing livelihood strategies of the Africans and nonwhites ensnared in the former homelands is seen as the corollary of the frustration the missionaries and administrators experienced, mainly caused by black tribalism, conservatism and ineptitude (Njubi, 2002; Mayer, 1980:15).

For example, the collapse of the economies in the 'native reserves'[17], which were largely agro-based, is attributed to "the inhibiting forces of social custom and a hostility to innovation, and a lack of response to market incentives" (Bundy, 1972:370). These interpretations confuse cause with effect. The approach of this study incorporates power relations to put the analysis in the right perspective.

3.2 Development of the peasantry

At the time contact was made with the Europeans in early 1650s the natives were engaged in pastoralism and some form of cultivation (Feinstein, 2005:13). However, between the early days of shifting cultivation and open grazing and the first half of the nineteenth century a class of peasants evolved in the former Transkei and Ciskei region (Bundy, 1979:5; 1972:369). The peasants converged around the vicinity of mission stations where European missionaries supplied the peasants with irrigation water via canals and furrows (Bruwer and van Heerden, 1995:4). Indeed, it was the policy of early colonial administrators to settle a considerable number of European farmers among the indigenous people to teach them Christianity and the art of European farming (Davenport, 1977:101).

The peasants in the former Transkei and Ciskei began land acquisition and thereby became landholders and successful farmers as long ago as the 1860s (Mayer 1980:14; Bundy 1972:373). The peasants sold excess grains and animal products to traders whose trading posts punctuated the countryside. With the introduction of the plough and other handy agricultural implements, new and high-yielding crop varieties and better methods of farming, the indigenous farmers produced more than their subsistence requirements. It was the time that unprecedented numbers of diamond mines were opened in the Cape Colony. The subsequent development of infrastructure, argues Bundy (1972:376), meant that the farmers could produce more to take advantage of the new markets in the mining centres.

[17] The term 'natives' is used interchangeably with 'blacks' to denote the inhabitants of the former homelands or native reserves.

With the discovery of gold in 1886, the demand for agricultural products grew to new heights and agricultural activities in the indigenous rural communities were intensely stimulated.

The above account illustrates that with enabling development policy, institutional arrangements (e.g. training, infrastructure and markets) and appropriate exotic agrarian technologies (e.g. irrigation, plough and high yielding crop varieties) the productive capacity of the natives of the Eastern Cape increased, wealth was accumulated and living conditions improved. As indicated in Section 1.1.7 of Chapter 1, a similar approach to irrigation and agricultural development was employed to find solutions to the problems of unemployment and poverty of the rural whites in South Africa in the 1930s.

3.2.1 Demise of the peasantry

The development of peasant agriculture was retarded right at the onset by frontier wars in the Eastern Cape. As was always the case, the vanquished, usually the natives, paid the price for peace – seizure of large tracts of land and herds of cattle by the conqueror, European settlers (Feinstein, 2005:37-43; Mayer, 1980:18; Beinart, 1979:200). Productive assets and resources of the natives were destroyed during wars, the most notable example being the 'Cattle-killing of 1857' (Beinart and Bundy, 1987:5; Davenport, 1977:101). The frontier wars marked the beginning of de-agrarianization and proletarianization processes in the black communities in South Africa. In effect, the peasantry did not have enough time to develop sufficiently to exert a lasting impact on the social economy of the native areas.

The development of the mining industry and white agricultural expansion contributed strongly towards the degeneration of the peasantry in the black communities (Feinstein, 2005:62). Continuous cultivation and reduction in fallow periods as the result of land expropriation and population pressure culminated in the loss of the fertility of the soil. Coupled with exploitation by traders and the lack of capital and inputs, agricultural production fell to drastic levels; the black communities could no longer be adequately supported by the peasantry (Bundy, 1972:386-388). This period coincided with the creation of employment opportunities in the mining and white agricultural sectors which provided an outlet for excess labour in the black communities. By the end of the nineteenth century the colonial government's policy of creating progressive peasants gave way to the creation of a uniform population of impoverished small cultivators and job seekers (Mayer, 1980:14).

With political instability, restricted access to land and a shift in policy focus from the development of peasant agriculture to commercial farming and mining, and poor pricing policies which enabled the traders to exploit the farmers, the hitherto self-sufficient and prosperous black rural farming communities were pauperised. Poverty and unemployment became widespread and a migrant labour system was instituted. The youth, mostly males, have since been migrating in large numbers to the urban areas and mining and industrial centres in South Africa as job seekers, leaving behind in the rural areas women, children and the aged to till the land. It is therefore true to argue that the large number of farmers aged over 50 years which bedevils both irrigation and dryland farming, as will be discussed in Sections 6.2.2 of Chapter 6 and 8.3.4 of Chapter 8, has its origin in the colonial policies which destroyed peasantry in the black rural communities.

3.3 Impact of colonial policies

The Eastern Cape came under colonial rule in the 1870s. The natives were alienated from decision and policy making. In the black communities traditional leadership maintained law and order and implemented policies received from the colonial authorities via district magistrates, in an indirect rule system of administration (Beinart and Bundy, 1988:7). The colonial policies were pervasive as they were enforced not only by the legal and security institutions but also by other social structures (besides the traditional authority system) such as the churches as discussed in the section that follows.

3.3.1 Christianity and Social Darwinism

Most of the natives converted to Christianity and aspired to European ways of life. The colonial policies however aimed at complete assimilation to reduce the natives to servants and consumers. The missionaries redefined their educational policies to undermine the notion of African potential. The educational system was re-planned to turn out products who would be “useful both to colonial society as labourers and workers, and to their own people as preachers and teachers” (Mayer, 1980:12). The notion which prevailed within the ranks of the colonialists and the missionaries was that educated natives would present a ‘threat’ to the *status quo*. Thus the type of education the missionaries offered the native population aided the colonialists to undermine the development potential of the natives. The dearth of expertise necessitated the engagement of Loxton, Venn and Associates and other development consulting firms by the Bantustan administrations to plan, develop and manage irrigation schemes in the former homelands at considerable social and economic costs (see Section 2.10 of Chapter 2).

3.3.2 The struggle for land

The discovery of diamonds and gold in 1867 and 1886 respectively intensified the struggle for productive and fertile agricultural land. The capacity of black peasants to take advantage of the ever-expanding markets was limited by their restricted access to land. The farmers with small landholdings lost their access to land in the face of fierce competition and intense land speculation and were pushed into migrant mine labour (Aliber, 2003:474). A considerable number of black tenant cultivators and sharecroppers were more successful than most white farmers (Bundy, 1972:377). The colonial government instituted a number of measures to curtail the access of blacks to land by reviewing and terminating most tenancy arrangements. The blacks were therefore pushed into subsistence farming. Local capacity for accumulation and enterprise was seriously hampered. With little or no education, the landless blacks had no alternative than to become migrant workers. The black areas of the former Transkei and Ciskei became a reservoir of unskilled labour.

With limited access to agricultural land and limited opportunities for capital accumulation, the majority of blacks could not acquire technical skills in farm production and farm management through practice. However, as discussed in the previous section, there was equally limited chance for blacks to acquire these essential agricultural skills through the formal education system. It is thus true to argue that the colonial policies laid the foundation for deliberate underdevelopment of black rural areas which necessitated the development of irrigation schemes to revamp the rural economies as discussed in Section 1.1.8 of Chapter 1. The discussion of the Qamata irrigation development policy in Section 4.3 of Chapter 4 suggests that the lack of agricultural production skills and capital in the Qamata area meant that the food crop irrigators who secured plots at the Qamata Irrigation Scheme required substantial assistance in techniques of crop production, marketing and subsidized inputs, among others, in order to put their irrigated plots into use as they had very little to start farming with.

3.4 Public policies of the Union of South Africa

The Union of South Africa was formed in 1910 between the two British colonies of Cape and Natal and two Boer Republics of Transvaal and Orange Free State. The blacks had hoped the Union of South Africa would ensure equality and development in the post-colonial society (Sihlongonyane, 2003:12). However legal and administrative actions were frequently employed to dispossess the blacks from the land and to entrench the migrant labour system.

3.4.1 Labour laws

The labour laws enacted by the Union Government between 1911 and 1924 were racially discriminatory. The laws included the Native Labour Regulation Act of 1911 which excluded blacks from tasks which required specialised skills, and the Industrial Conciliation Act of 1924 which barred black workers from all kinds of industrial council machinery for negotiating conditions of employment (Feinstein, 2005:75-88; Byrnes, 1996). The labour laws impacted negatively on the economic development of the former homelands because lower wages reduced frequency and amount of remittances, which were a major source of capital for agricultural development of in the rural areas. Besides, skills and better techniques of production could not diffuse into the rural economy as blacks were prohibited from acquiring skills. The availability of skills and access to capital shaped the outcome of irrigation development programmes in the former homelands after the withdrawal of state financial and institutional support after 1994 (see Section 1.1.9 of Chapter 1). The smallholder irrigation farmers could not cover their operation and maintenance costs; besides, they could not perform most of the farming tasks themselves.

3.4.2 The Land Act, No. 27 of 1913 and the Native Trust and Land Act, No. 18 of 1936

The first major assault on the natives' right to self-determination and development was the promulgation of the 1913 Native Land Act. The Act reserved 7 per cent of South Africa's territory for exclusive black occupation and blacks were equally prohibited from acquiring land outside the 'scheduled' areas (Sihlongonyane, 2003:13; Lahiff, 1999:6; Bundy, 1979:213; Plaatje, 1916). The 1913 Act curbed the widespread practice of sharecropping which afforded large number of black farmers access to white-owned landholdings which were not farmed by the whites (Lahiff, 1999:6). The Act favoured the whites because they had the essential say in the selection of political leaders. On this point, the central contextual question relates to how political behaviour shapes economic policy and hence economic development (Grindle, 1999:2).

The 1936 Native Trust and Land Act extended the territorial expanse of the reserves to 13 per cent and created the South African Native Trust (later the Development Trust) to procure the 'released' land and plan its use. By the end of 1987, the reserves constituted approximately 13.8 percent of South Africa's surface area. The 1936 Native Trust and Land Act established an elaborate system of compulsory registration and control of tenant farmers which provided the basis for most farm removals (Human Rights Watch, 2004). The 'redundant' blacks from white farms and towns were forcibly resettled in the native reserves, resulting in intense overcrowding.

The 1913 Native Land Act and 1936 Native Trust and Land Act tightened the grip of the political authorities on the social economy of the black areas. The forcible concentration of landless people in the homelands had dire consequences on irrigation development in the former homelands. As will be discussed in Sections 4.3 of Chapter 4 and 7.2 of Chapter 7, the sizes of the allotments at the Qamata Irrigation Scheme are very small and unsustainable because the irrigation scheme had to provide means of sustenance for many landless and unemployed people who were forced to live in the Qamata area.

3.4.3 Betterment planning

The Agricultural Betterment Act was enacted in 1939 to improve the socio-economic conditions in the native reserves. De Wet (1995:41) argues that the betterment planning as a state policy was motivated by the state's concern for the apparent soil erosion and the ensuing poverty in the native reserves. The betterment scheme divided the native trust land in the rural areas into residential, grazing and arable areas. The scheme concentrated scattered homesteads into compact resettlement villages, especially on state sponsored irrigation schemes (Mayer, 1980:19). The ultimate aim of betterment planning was to resettle the landless and turn them into a class of *bona fide* farmers. The Qamata area experienced the brunt of the betterment policy as stringent resettlement and soil conservation measures were instituted to protect the Qamata Irrigation Scheme (ARDRI, 1996:7).

Because of the enormity of the size of the population resettled in the homelands, the parcels of land allocated to individuals were too small to encourage large-scale agriculture, dashing the initial hope of creating a class of *bona fide* farmers. Agricultural production in the reserves was also constrained by the lack of markets, credit facilities, inputs and intensive cultivation technologies and techniques. The state initiatives were therefore not conducive to the development of commercial agriculture (O'Connell, 1980:48). One is therefore inclined to side with McAllister (1991) that the original aim of the betterment planning was neither environmental protection nor the development of sustainable livelihoods in the reserves, but a means of maintaining white domination of the social economy of the Union and preparing the stage for racial politics and development.

The betterment planning failed to provide institutional support to transfer irrigation technology to the local communities in order to develop the irrigation schemes that were in operation prior to the release of the Tomlinson Commission's report in 1955. Consequently, when the state sponsored smallholder irrigation schemes were established from the 1960s onwards, the food crop irrigators were plagued with skills shortages and an inadequate supply of the resources required by the techniques of production that came with the irrigation technology. As will be discussed in Sections 7.3 of Chapter 7 and 8.4 of Chapter 8, these problems still persist in smallholder irrigation farming at Qamata.

3.5 The impact of apartheid policies on development

Under the apartheid system (between 1948 and 1994), race and racial discrimination was the single dominant consideration which determined and affected all aspects of socio-economic life in South Africa. The government embarked on a systematic campaign to transform black tenant farmers into migrant labourers through the vigorous enforcement of the 1936 Native Trust and Land Act. In addition, a series of laws was passed to accelerate the removal of squatters from farms, and from urban areas (Feinstein, 2005:151-157). The victims of forced removals were crippled by the Native (Prohibition of Interdicts) Act of 1956 which denied black people the right of appealing to the law courts against forced removals. In 1986 when the aim had largely been achieved, the forced removal laws were repealed.

3.5.1 'Bantu' education

In the 1950s black education came under the spotlight of the decision-making authorities. The ideology that prevailed in the ranks of the ruling party was that the natives were different and had to be taught differently. However, the real sentiment was that the black learners were taught liberal ideas which constituted a threat to the concept of white domination (Feinstein, 2005:159-160; Mayer, 1980:31-32). The first major attack on black education was the Bantu Education Act of 1953. The Act established a black education department charged with the responsibility of developing a curriculum that specifically suited the nature and requirements of the black population. The type of education prescribed by the Act provided the Africans with skills needed to serve their own people in the homelands or to work as labourers under whites (Mayer, 1980:12). Key subjects such as mathematics and the sciences were not taught in the native schools. The Extension of University

Education Act of 1959 created separate tertiary institutions for whites, coloureds, Asians and blacks. The blacks were given the least amount of money and other resources. Besides, black institutions lacked teachers and safe environment the most (Hill, 2003:5).

The long term effect of the Bantu Education policy was the acute paucity of skills and expertise in all fields of economic activity in the former homelands. Its impact on irrigation technology transfer was phenomenal: the level of education of the irrigation farmers was very low as was the level of training of the extension workers in the homelands. According to the Ministry of Agriculture and Land Affairs (1998:3.2), before 1994 the extension workers in South Africa were generally well-trained, mostly university graduates whereas in the former homelands, as will be exemplified by the discussion in Section 7.8 of Chapter 7, the public extension staff generally lacked adequate training. Therefore, it is not surprising that the irrigation technology transfer policy could not achieve the intended aim of turning landless people into a class of *bona fide* farmers.

3.5.2 Report of Tomlinson Commission

Black enterprise was blocked and frustrated in all sectors of civil society. A large number of blacks were forced into the role of economic dependence (Beinart and Bundy, 1988; and Davenport, 1977). By the late 1940s the environmental and socio-economic conditions in the native reserves had deteriorated to such an alarming state that signs of poverty, deprivation and hopelessness, a potential recipe for social unrest and violence, were widespread. In response to nationwide concern, the government set up the *Commission for the Socio-economic Development of the Bantu Areas within the Union of South Africa* (also known as the Tomlinson Commission) in 1951/52 to study the situation and make recommendations for socio-economic reconstruction of the native reserves.

The report of the Commission is worth mentioning in this study because it provoked an awareness of African affairs in the Union and determined the direction that development policy assumed thereafter in the homelands. In 1955 the Commission presented a detailed report to the government. The report sought to identify the factors which conditioned and shaped the totality of life in the Bantu reserves. This study considers primarily aspects of the report that highlighted the need for agricultural and rural development, irrigation technology transfer and infrastructure thereof, and their influence on later socio-economic development in the homelands.

3.5.2.1 Land reform and rural development

The Commission regarded a revision of landholding systems for the purpose of ensuring security of tenure as one of the conditions necessary for socio-economic development, particularly the emergence of commercial farmers in Bantu areas. It unambiguously recommended that requests for land should be granted under title deed. It did not favour the existing system based on the principle of 'one-man-one lot' because it reduced "every Bantu to a low level of uniformity with no prospect of expanding his activities or of exercising his initiative" (*Commission for the Socio-Economic Development of the Bantu Areas within the Union of South Africa*, 1955:152). The corollary of freehold was, as envisaged by the Commission, to enable the people to "exercise their initiative and to develop according to their individual ability and resources" (*Commission for the Socio-Economic Development of the Bantu Areas within the Union of South Africa*, 1955:152). Hence, it recommended the creation of economic units for full-time farming, capitalist development and investments in the homelands in order to absorb the portion of the population expected to be landless.

The Tomlinson Commission proposed the diversification of the rural economy: development efforts were also to be focused on non-farm activities (e.g. agro-based industries). The rationale was that such activities could stimulate agricultural development by way of increased demand for foodstuffs and other farm produce thereby making income available for investment in livestock and cultivation (Meagher, 1998:5). The Nationalist Government rejected the basic recommendations of the Commission with the excuse that their implementation would involve too high an expenditure which the government could not afford. The government was not prepared to develop the black areas, a move which would have cut out the flow of the much needed cheap labour from the reserves.

The irrigation policies that were formulated in the homelands after the publication of the Commission's report continued to allocate uneconomic plots to the farmers (see Section 4.3.1 of Chapter 4). Irrigation farming has not therefore developed beyond subsistence. Poverty and food insecurity still ravages the rural areas. The Commission's report did not have a positive impact on irrigation technology transfer in the homelands as tenurial arrangements and institutional support at the irrigation schemes remained unchanged.

3.5.2.2 Techniques of production and technology transfer

The Native Land and Trust Act of 1936 necessitated the use of intensive farming techniques to replace extensive farming methods which blacks had known for greater part of their farming career because the size of farms shrank and that of the population soared. The intensive farming practices, including the use of irrigation water, hybrids, fertilizers and pesticides, allow a higher yield per unit area. To be successful, intensive farming requires training and transfer of essential techniques and skills which the natives in the reserves lacked. Although the Tomlinson Commission recommended the creation of smallholder irrigation projects in the reserves to augment agricultural production in the face of land shortages, it failed to recommend the training of the black farmers in the necessary techniques of intensive farming. The absence of any provision for the transfer of irrigation technology to the rural poor in the reserves in the Commission's report should be seen in the broader context of apartheid: it would have enabled the black farmers to compete with their white counterparts and this could have compromised the *raison d'être* of white supremacy and white domination of the social economy of the country. Therefore where smallholder irrigation projects were established in the former homelands, the local farmers could not benefit significantly from the investments because they lacked the capacity to use the irrigation facilities effectively (see Section 7.9.3 of Chapter 7).

3.5.2.3 Education

The Tomlinson Commission endorsed the policy of a separate education system for each of the racial groups in South Africa in order to protect the culture of the natives. However Cross (1999:87) argues that a single education system for all the peoples of South Africa would have constituted a major threat to the concept of white domination which defined the policy of separate development. As will be indicated in Sections 6.2.5 of Chapter 6 and 7.9.3 of Chapter 7, the direct effects of the Tomlinson Commission's endorsement of the education policy in vogue in the former homelands were the low levels of education and training of both the farmers and extension workers and the shortage of essential farming skills that, in the years that followed, hindered the efforts of the Bantustan administrations to transfer irrigation technology to their rural communities.

3.5.2.4 Implications for policy-making

The Tomlinson Commission certified the creation of separate Bantu territories. This meant that the inhabitants of the former Transkei and Ciskei continued to be excluded from political processes. They did not have control over the political decision makers and their problems and views hardly found their way on to the national agenda to be crystallised into appropriate public policies. From a policy-making perspective, the Tomlinson Commission did not bring relief to the inhabitants of the former homelands. It however endorsed the processes and systems which entrenched their poverty and deprivation and eventually prevented them from benefiting from irrigation technology transfer policies and programmes in their communities.

3.6 The birth of Bantustan administration

The foundation for the establishment of the Bantustans was laid by the 1913 Native Land Act and the 1936 Native Trust and Land Act. The Bantu Authorities Act of 1951 formally established the black homelands with the aim of creating greater self-government in the homelands. The Act created territorial tribal authorities to provide the basis of local African self-government in the homelands (Feinstein, 2005:250-256). The Bantustan Authority Act of 1951 therefore reinforced earlier policies which instituted the arrangement that every person, black or white had to live in an area designated as their 'own area'. For the blacks it meant living either in an impoverished native reserve, or in a black township near a white town.

3.6.1 Traditional authority and local government

The retention of the system of African chiefs was essential to the administration of the Bantustans (Republic of Transkei, 1991:92). The Bantustan Authority Act of 1951 granted the chiefs more power locally and used them as agents of the policy of separate development. By retaining the system of chiefs, the government sought to silence the section of the African population likely to agitate, through popular participation, for more radical changes (Cook, 1980:310). The political authorities appointed chiefs and headmen and deposed those who did not carry out government orders and policies. A system of headmen was established to assist the chiefs to maintain law and order. The traditional system had long denied women the basic rights of inheritance, access to land and other factors of production (Cook, 1980:310). The traditional leaders terminated unlimited cattle grazing (Simons, 1968:187-188). Under the pretext of preserving culture and traditions of the past, aspects of the socio-economic development in the homelands were retarded by the traditional authority. For instance, at QIS the development of female irrigation farmers was retarded because the irrigated plots for commercial farming were allocated to men (see Section 4.3.1 of Chapter 4).

3.6.2 The legacy: impact of separate development on local government

Historically, the greater proportion of local government revenue was generated locally, largely through taxation and the delivery of services to residents and businesses. The system of local government that emerged in the homelands was characterized by poor infrastructure and inferior service delivery (as compared to the quality and variety of services offered in South

Africa). The concentration of people in the homelands led to a significant increase in the demand for infrastructure and services but did not expand the sources of revenue of the municipalities because the majority of citizens were relegated to relatively low-paid wage labour (Fast and Kallis, 2004:8 and 10). Besides, according to Fast and Kallis (2004:8), “Apartheid regulations banned most retail and industrial developments in black areas. This limited the revenue base and forced residents and retailers to spend most of their money in white areas”. The cash stranded local government entities could not attract the required skilled manpower and resources to provide the appropriate infrastructure and services necessary to stimulate local and community development (McCourt, 2000:8). Consequently, the system of local government in the former homelands did not play any meaningful role in the transfer of irrigation technology to the local farmers because the local government entities lacked the capacity to respond adequately to the development needs of the people, especially in the field of irrigation and agricultural development.

3.7 The administration of the former Transkei

3.7.1 Politics and administration under Chief K. D. Matanzima

Early in the 1960s, the local political leaders in Transkei led by Chief K. D. Matanzima began to press for self-government (Baron, 2003). Under the Transkei Constitution Act of 1963 the South African government granted Transkei self-governing status and Chief K. D. Matanzima became the Chief Minister of the territory. The various organs of government, namely, the Transkei Legislative Assembly, executive cabinet and judiciary were established. The majority of the seats in the legislative assembly were reserved for chiefs, most of whom had cooperated with the South African government during the earlier administration of the Bantustan. This patronage, *inter alia*, compromised the effectiveness of the state apparatus in dealing with the problems of underdevelopment in the territory as it encouraged corruption (Fast and Kallis, 2004:9) and discouraged popular participation at the grassroots (see Section 3.6.1 of this chapter). Besides, all the laws that the legislature enacted required the approval of the President of South Africa.

The self-governing territory of Transkei (Figure 3.1) was granted ‘independence’ in 1976 and its citizens immediately lost their South African citizenship (Federico, 2001:11; A Dictionary of World History, 2000; Harvey and Dean, 1978:189). Transkei under Chief K. D. Matanzima’s leadership was intended as the showpiece of the South African government’s policy of separate development. However, the independence of Transkei was limited by its reliance on the South African government for financing its annual budgets.

Owing to the structural instabilities (e.g. mass poverty and skill shortages) apartheid created in the Transkei, a high level of government intervention guided by a clear vision was required in order to promote sustainable rural development. However because of corruption, paternalism, patronage and nepotism, development policies were flawed (Cherry and Bank, 1993) and, as will be discussed in Section 7.9.1 of Chapter 7, the rural poor cautiously developed passive attitude towards collective action in their communities. Firstly, the system of local government in the rural areas enabled the chiefs who supported Matanzima’s regime to reign supreme. According to Cherry and Bank (1993), this system of power, authority, and control in rural areas had been the instrument of political domination and repression in the Transkei since the colonial days. It was premised on the denial of the democratic rights of the rural people, and also resulted in corruption and victimization.

Secondly, there is no evidence to suggest that a ‘bottom-up’ approach which encourages grassroots and popular participation in the development process was adopted then as a development strategy, although the planning authorities and policy makers appreciated the potential of the approach (Republic of Transkei, 1991: 300; 1983:1-5). The growth pole development paradigm, a version of top-down development concept, was in vogue in the

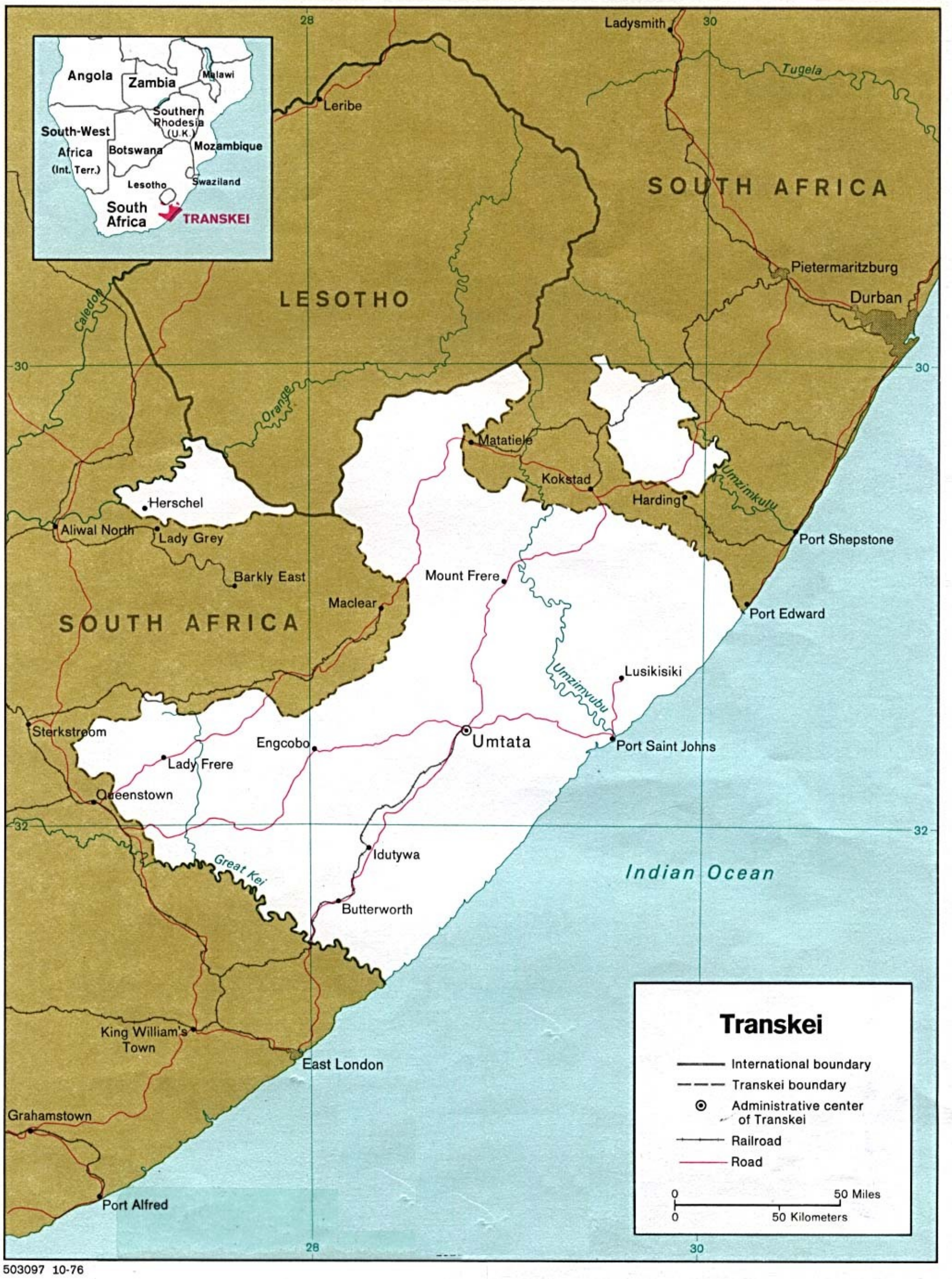

Figure 3.1 Map of south-eastern South Africa showing the situation and territorial expanse of the former Transkei (Perry-Castañeda Library Map Collection, 2006)

Transkei. Because participation is central to a bottom-up approach to development, it requires a measure of decentralization of authority and decision-making to flourish (Cornwell, 2003:53). The most conspicuous feature of the administration in the former Transkei was the over centralization of authority in Umtata necessitated by the need to suppress dissidents and opposition to the homeland system (Baron, 2003). Patronage and the imposition of development policies via the top-down development strategy did not augur well for the irrigation technology transfer programme because the beneficiaries reacted passively to the approach as local initiative was discouraged (see Section 7.9.1 of Chapter 7).

3.7.2 Transkei under military rule

In September 1987, Chief George Matanzima was forced to resign as Prime Minister as a result of his alleged involvement in corruption. The reign of Stella Sigcau who replaced Chief George Matanzima barely lasted for twelve weeks and she was ousted by General Bantu Holomisa in a military coup in December 1987 on an anti-corruption ticket (Cherry and Bank, 1993). Holomisa’s administration did not overhaul the entire system of local government but removed repressive chiefs and created a political platform for traditional authorities to be challenged by their respective subjects.

In the early 1990s civil society organisations sprang up throughout the Transkei and the Ciskei and clashes with chiefs over allocation of land and distribution of development resources became commonplace (Cherry and Bank, 1993). The civic organisations challenged the systematic corruption and bribery that characterised rural life. In the light of the liberal ideas and measures the military regime introduced, the government unveiled a radical policy proposal for agricultural and rural development which is discussed below.

3.7.2.1 Policy on agricultural, irrigation and rural development

In July 1991, the military government published an agricultural and rural development policy document, entitled ‘Transkei Agricultural Development Study’ (Republic of Transkei, 1991). It was a review of agricultural and rural development in Transkei and contained a variety of recommendations for a new agricultural and rural development strategy. The recommendations pertinent to irrigation technology transfer and rural reconstruction are examined below against the background of previous attempts at land use planning and rural development in the Bantustan.

With regard to the development of commercial farming, the ‘Transkei Agricultural Study’ shared similar sentiments with the Tomlinson Commission (see Subsection 3.5.2.1 of this chapter). It recommended the establishment of a new tenurial arrangement conducive to the emergence of a class of local commercial farmers to replace the subsistence farmers (Republic of Transkei, 1991:99). In order to encourage progressive farmers to produce surplus for the market, it was recommended that they should gain access to the landholdings of absentee land owners. Under the principle of 'one man one plot' much of the land was held by people who did not use it productively (McAllister, 1992:1). It identified "inadequate extension advice, lack of cash, lack of commercial farming experience, marketing problems and confused administration" as the main challenges of the agricultural industry in the former Transkei (Republic of Transkei, 1991:109). These problems are largely the manifestations of inadequate institutional support and services that were designed to aid agricultural development (see Section 4.4.3 of Chapter 4).

The Transkei Agricultural Study observed that "the situation at Ncora, Qamata and Xonxa Irrigation Schemes is more problematical due to the fact that these projects are not economically viable" (Republic of Transkei, 1991:185). It noted that "most of those schemes have run at a loss, … they obviously cannot be said to be cost effective" (Republic of Transkei, 1991:252). According to the document (Republic of Transkei, 1991:253), "There are many reasons for their unsatisfactory economic performance, starting with the way in which they were developed: in one "big bang" without proper planning or consultation, and without local experience of the agronomic and economic management of large schemes. Problems of land tenure, the estate-type modus operandi and the lack of trained people all aggravated the situation". It recommended that the overall strategy should be changed "from one of State farming to one of redistributing the land to individual small-scale commercial farmers" (Republic of Transkei, 1991:185). The recommendations, based on the basic tenets of irrigation management transfer (IMT) (see Section 2.11 of Chapter 2), aimed at reducing the financial burden on the Bantustan government.

The Transkei Agricultural Study recommended that "local grassroots development bodies should now become the focus of all rural development efforts" (Republic of Transkei, 1991:36). It favoured a bottom-up rural development strategy and proposed that all interventions in rural areas should be carried out in consultation with local communities. It perceived development as “helping people to help themselves” (Republic of Transkei, 1991:33). Indeed, the document itself was prepared in consultation with commercial and subsistence farmers, development specialists, academics and a number of NGOs (Republic of Transkei, 1991: Forward by Chief J. N. M. Matanzima the then Minister of Agriculture and Forestry).

3.7.2.2 Critical view of the ‘Transkei Agricultural Development Study’

Although the recommendations of the policy proposal were radical and far-reaching, a closer look at the document reveals that most of the recommendations were premised on the same kind of concerns that gave birth to the policy of betterment planning, namely:

i. the prevailing communal land tenure retarded agricultural and rural development and land reform was imperative; and,
ii. rural and agricultural development requirements necessitated the displacement of unproductive farmers and the allocation of their landholdings to more progressive farmers for the purpose of developing commercial agriculture.

Many commentators wonder why the policy proposals were premised on the above concerns because the basic assumptions were unfounded (McAllister, 1992:9; De Wet, 1995:41; Tapson, 1988:335). There is no evidence which suggests that African traditional land tenure system *per se* retards agricultural and rural development (Roth and Haase, 1998:2). The available evidence provided by the betterment planning policy rather suggests that attempts to meddle with indigenous tenure to address supposed problems in rural and agricultural development led to environmental despoliation and decline in agricultural productivity. In a comparative study of communal land tenure and freehold systems in the Ciskei, De Wet (1991) concluded that it is factors such as accessibility of inputs, marketing and credit facilities and extension services, *inter alia*, that determine agricultural productivity. Land tenure exerts negative influence on farm productivity where traditional institutions coexist with modern agricultural practices as happened in the smallholder irrigation schemes in the former homelands (see Section 2.9.1 of Chapter 2).

One important factor which would have enhanced the productivity of the irrigation schemes and the development of sustainable rural livelihood options, but was missing in the policy proposal, was irrigation technology transfer and skills acquisition. Besides, the recommendations did not suggest how to improve institutional services to render the irrigation schemes viable and sustainable. The proposals were published at a time when the political authorities and decision makers in Transkei were preoccupied with political negotiations to transform the entire South African state from the apartheid system into a democratic dispensation. The uncertainties that characterised the period overshadowed the importance of the proposals and the plight of the rural poor, and nothing much was ever heard of the 'Transkei Agricultural Development Study' up to the time of reincorporation of the territory into South Africa.

The lesson that emerges from the examination of the Transkei Agricultural Study is that democratic local governance is essential to rural and agricultural development because it facilitates grassroots participation which provides planners and decision makers with insights into the livelihood strategies and problems of the rural poor (see Section 7.9.1 of Chapter 7). The section that follows discusses how democratic practices and policies have altered the approach to rural development in general and irrigation technology transfer in particular in post-apartheid South Africa.

3.8 Post-apartheid development policies

The demise of apartheid in 1994 witnessed the extension of political and administrative democracy into South Africa's black rural areas in an attempt to establish a developmental state in order to address the inequalities and backlogs of the past to ensure that all areas are brought into the mainstream of development. Popular participation was seen as the most prudent means of bringing development to the people in the rural areas (Davids, 2003:34). As will be exemplified in Section 7.9.1 of Chapter 7, local communities were denied the right of participation in the planning of community development initiatives prior to 1994, and most of the initiates failed to achieve their intended objectives. In order to make development policy more responsive to the needs of local communities after 1994, it was deemed necessary to decentralize decision-making to the levels of local government (Cornwell, 2003:53). The 1996 Constitution of the Republic of South Africa provides for three distinct and interdependent spheres of government, namely, national government, provincial government and local government. The Constitution identifies municipalities[18] as the sphere of government closest to the people and charges them with the responsibility of ensuring the delivery of affordable basic services to the people and promoting economic and social development at community level. In effect, the Constitution established a developmental local government system in the country.

The 1998 White Paper on Local Government (Republic of South Africa, 1998) impelled municipalities to integrate development planning with community-based goals. It advocated the democratization of the development process and the redistribution of assets and opportunities in favour of the poor. It proposed new municipal structures that combine previously racially segregated jurisdictions (Fast and Kallis, 2004:12). According to Pycroft (2002:114) the extension of local municipal boundaries to incorporate small rural towns and adjacent rural areas is an acknowledgement of the economic, social and political linkages between rural and urban areas.

The Municipal Systems Act (Republic of South Africa, 2000) focuses on the internal and external municipal administrative systems to be used by municipalities to provide services to their communities. The defining feature of the Municipal Systems Act, 2000 is the provision for public participation in local governance (Davids and Maphunye, 2005:60). For example, it is compulsory that the public participates in the drafting of the content of the Integrated Development Plan (IDP). Further discussion of the IDP is offered in Section 3.8.3 of this chapter. The legislation and policy directives discussed above were crafted in order to create financially viable and sustainable municipalities which could respond to the socio-economic needs of local communities in a democratic and participatory fashion (Davids and Maphunye, 2005:61).

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[18] Municipalities are classified into three categories, viz, Category A (metropolitan areas), Category B (local municipalities falling within Category C), and Category C (a district including more than one local municipality (Constitution of the Republic of South Africa, 1996: Section 155).

3.8.1 Reconstruction and Development Programme

The Reconstruction and Development Programme (RDP), introduced by the government in 1994, was the first ambitious attempt to establish a coherent socio-economic policy framework that would lead to the transformation of South Africa, especially the disadvantaged black rural areas. It adopted the basic needs approach to clear the backlogs in the provision of basic services such as housing, education, the supply of potable water and electricity. Substantial financial resources were transferred from the central government to provide infrastructure and services at the local level. Rural development was approached from the angle of sectoral interventions with integration limited to managerial coordination (Greenberg, 2003a:17-18). The RDP therefore called for the establishment of a national Ministry of Rural Development and Land Reform to coordinate and supervise the reconstruction of the rural areas and demanded fundamental changes to institutions and processes to “pass much of the control of democratic government funded services to the rural people for whom they are intended” (African National Congress, 1994:85). But the national Ministry of Rural Development and Land Reform as proposed by the RDP was not established probably because of the increasing “emphasis on fiscal stringency at the central state and cost recovery at the local state to generate development funds” (Greenberg, 2003a:19).

In 1995 the Rural Development Strategy (RDS) replaced the transfer of funds from the central government with locally generated state income. This meant that the rural poor had to finance their own development through a cost recovery initiative. The RDP Office was thus closed in 1996. The shift in approach to development in 1995 marked a change in the government’s macro-economic policy towards neo-liberalism which was in vogue internationally (Mouton, Waast, Boshof, Grebe, Ravat and Ravjee, 2001:9). The RDP did not have any appreciable impact on irrigation technology transfer because the period within which it was implemented was too short to initiate significant changes in the irrigation schemes.

3.8.2 Growth, Employment and Redistribution

The government launched its macroeconomic policy called the Growth, Employment and Redistribution (GEAR) strategy in 1996 after the closure of the RDP Office. Sustainable economic growth based on competition and free market system became the *raison d'être* of the policy (Department of Finance, 1996:2). As a classical neo-liberal economic policy, it thrives on the notion that economic growth would lead to a reduction in poverty and creation of more employment opportunities which would ultimately provide better life for all South Africans. GEAR reinforced the cost recovery strategy for investments in social and economic infrastructure and encouraged public-private partnerships (Department of Finance, 1996:14). Under GEAR, a Rural Development Framework (RDF) was established and charged with the task of rural development. The RDF aimed at redistributing government expenditure to previously deprived areas and expanding infrastructure programme to address backlogs in service provision. Government funding was kept at the barest minimum (Rural Development Task Team, 1997:15-19). Planning was decentralized to local government level because accurate local data were needed for resource allocation. GEAR has adversely affected irrigation technology transfer because essential institutional support and services, such as training and subsidies, had to be curtailed as a result of the reduction in government expenditure (Section 8.12 of Chapter 8).

3.8.3. Integrated Sustainable Rural Development Strategy, Integrated Development Plan and Local Economic Development

The rural people, through the Rural Development Initiative (RDI), a coalition of NGOs and trade unions, successfully placed issues of concern to rural communities on the national agenda. Consequently, the government designed a new rural development programme as the previous development policies and programmes were biased to favour urban communities (Davids, 2003:33-39). The Integrated Sustainable Rural Development Strategy (ISRDS) emerged as the official strategy for rural development in South Africa in 2000.

The vision of the ISRDS is to attain "socially cohesive and stable communities with viable institutions, sustainable economies and universal access to social amenities, able to attract skilled and knowledgeable people, equipped to contribute to their own development and the nation's growth and development" (Office of the Deputy President, 2000:1). The strategy includes such initiatives as infrastructure development and community-based income generating programmes. From the perspective of the ISRDS, rural development is interpreted more broadly than poverty alleviation through intervention programmes and state transfers which characterised previous attempts at rural development in the post-apartheid period. It is envisaged that sustainable rural economies will be created as the strategy contributes to increased local economic growth and the rural people participate and care about its success.

The IDP process is the tool by which the ISRDS is to achieve integration and popular participation at the local level. The IDP identifies local government structures, particularly district municipalities, as the key role-players to manage and integrate rural development programmes at the local level and to ensure that local needs are appropriately responded to (Office of the Deputy President, 2000:iv). The IDP emphasizes building the capacities of rural local municipalities for decentralization to achieve the desired rural development outcomes. Every new municipal council that comes into office after local government elections has to prepare its own IDP which will guide it for the five years that it is in office.

Integration and sustainable development are to be achieved through Local Economic Development (LED). Local economic development is a locally driven process designed to identify, harness and utilize resources to stimulate the local economy and create new viable and sustainable job opportunities (Umsebe Development Planners, 2002:7). The primary aim of LED is to establish partnership between local communities, government and the business sector to engage in economic activities to improve local socio-economic conditions. The programme offers local decision-makers and citizens the opportunity to gain increasing say over economic and social development in their localities.

Nowhere in the ISRDS, IDP and LED does land reform receive attention. Given the importance of land in the rural economy, the omission of land reform is a travesty (Davids, 2003:40). Besides, as discussed in Section 2.9.1

of Chapter 2, the policies of IDP and LED at local and district municipal levels favour the development of the other sectors of the rural economy, especially tourism, more than irrigation technology transfer. These policies have therefore not been able to develop smallholder irrigation beyond subsistence production. The image of a welfare state created by the RDP has been removed by the cost recovery policies of GEAR and ISRDS. The smallholder irrigators have to finance the development of irrigation agriculture. What makes the situation bleak is the absence of a comprehensive programme to train the smallholder irrigators to acquire essential skills and expertise in the art of modern irrigation agriculture, or a systematic attempt to transfer some form of easy-to-grasp and use irrigation and other agricultural technologies (see Sections 2.3 and 2.4 of Chapter 2) to the farmers to step up productivity. It is thus difficult to envisage how the smallholder irrigators can access the services and infrastructure created under ISRDS policy to break the bonds of poverty.

3.9 Summary

The poverty in the rural areas of the former homelands in South Africa is structural because it has been created by social, economic and political systems which began as long ago as the second half of the 1600s. The structure has been built by means of a deliberate manipulation of land and labour through public policies. Throughout the twentieth century the homelands produced extremely low agricultural yields as they suffered from a lack of skills and resources, congestion and environmental degradation. Attempts at rural development under apartheid did not address the need to transfer irrigation technology to the local farmers. What was needed was capacity building and appropriate agricultural and irrigation technologies for blacks to cope with land scarcity and overpopulation. The betterment planning, for example, did not provide for capacity building in irrigation agriculture. However, agricultural development was seriously restricted by inadequate rainfall and drought. No systematic effort was made to develop the homelands because the blacks were disenfranchised and could not effectively participate in the policy-making processes.

The homeland system did not bring relief to the blacks in the Eastern Cape in terms of poverty alleviation as the homelands were mere appendages of the South African government and could not initiate radical policies to terminate the relationship which generated cheap unskilled labour for the South African economy. The homeland authorities failed to introduce fundamental changes to build the capacity of the farmers through training and the transfer of irrigation technology to enable the rural people to earn a decent livelihood from farming. Even where irrigation agriculture was introduced, inadequate efforts were made to involve the local communities because the development policies were rooted in top-down and growth pole paradigms owing to over centralization of authority. The irrigation development process in the homelands was so haphazardly managed that by the end of the apartheid almost all the major smallholder irrigation schemes were moribund, especially in the former Transkei.

The advent of democracy in South Africa has brought remarkable changes in rural development policies. Grassroots participation is encouraged and special policies have been enacted to place the task and responsibility of development in the hands of the rural people. However the introduction of cost recovery policies has retarded the rate at which the rural people access the available services to facilitate their development. Besides, the contemporary development policies do not specifically target the transfer of irrigation and agricultural technologies to the rural people, although the majority of the people in the rural areas depend on agriculture for their livelihood. Consequently, the efforts to establish a new order in the rural areas in the Eastern Cape to make them economically viable, socially stable and comfortable places of human abode have yielded limited positive results. It appears these measures do not go far enough to adequately tackle the structural problems of the province.

In the next chapter the discussion will move from the general to the particular. The policy processes and effects discussed above will be explored in the context of a specific case, the Qamata Irrigation Scheme. Attention will be focused on Qamata irrigation development policy, capacity building, management structures and farm operations.

CHAPTER 4

THE QAMATA IRRIGATION SCHEME

4.1 Introduction

The particularities of the Qamata Irrigation Scheme (QIS) are discussed in this chapter. The purpose of the discussion is to provide the context for the presentation of the outcome of the empirical survey. The focus of the discussion is, therefore, the development policy upon which the scheme is based. The development policy defined the key institutions, structures and systems by which the scheme is operated and managed. Besides this, farming methods and practices and the scheme's management structures are presented to prepare the reader for the outcome of the survey.

The Qamata Irrigation Scheme is located in the Qamata Basin on the banks of the Indwe River near its confluence with the Great White Kei River. It is 15km south of Lubisi Dam which supplies the scheme with water via a gravity canal. The western portion of the scheme draws irrigation water from the Great White Kei River and the Xonxa Dam (Figure 1.4). The entire scheme covers a total surface area of about 2 601 ha (ARDRI, 1996:6). The scheme stretches across two tribal authorities, namely, Qamata Tribal Authority in the north, and St. Marks Tribal Authority in the south (Figure 4.1).

4.2 Planning and development of QIS

The idea of developing an irrigation scheme on the banks of Indwe River in the Qamata Basin was mooted by the District Magistrate of St. Marks in 1940. However, the irrigation project never went beyond the discussion and subsequent agreement between the District Magistrate and the Paramount Chief, K. D. Matanzima because the South African Native Trust which was charged with the socio-economic development of the homelands was preoccupied with the implementation of the betterment planning strategy in the district. In the 1960s the idea was revisited (Personal communication, Chief S. E. Matanzima at the Great Place on 21 December 2004)[19].

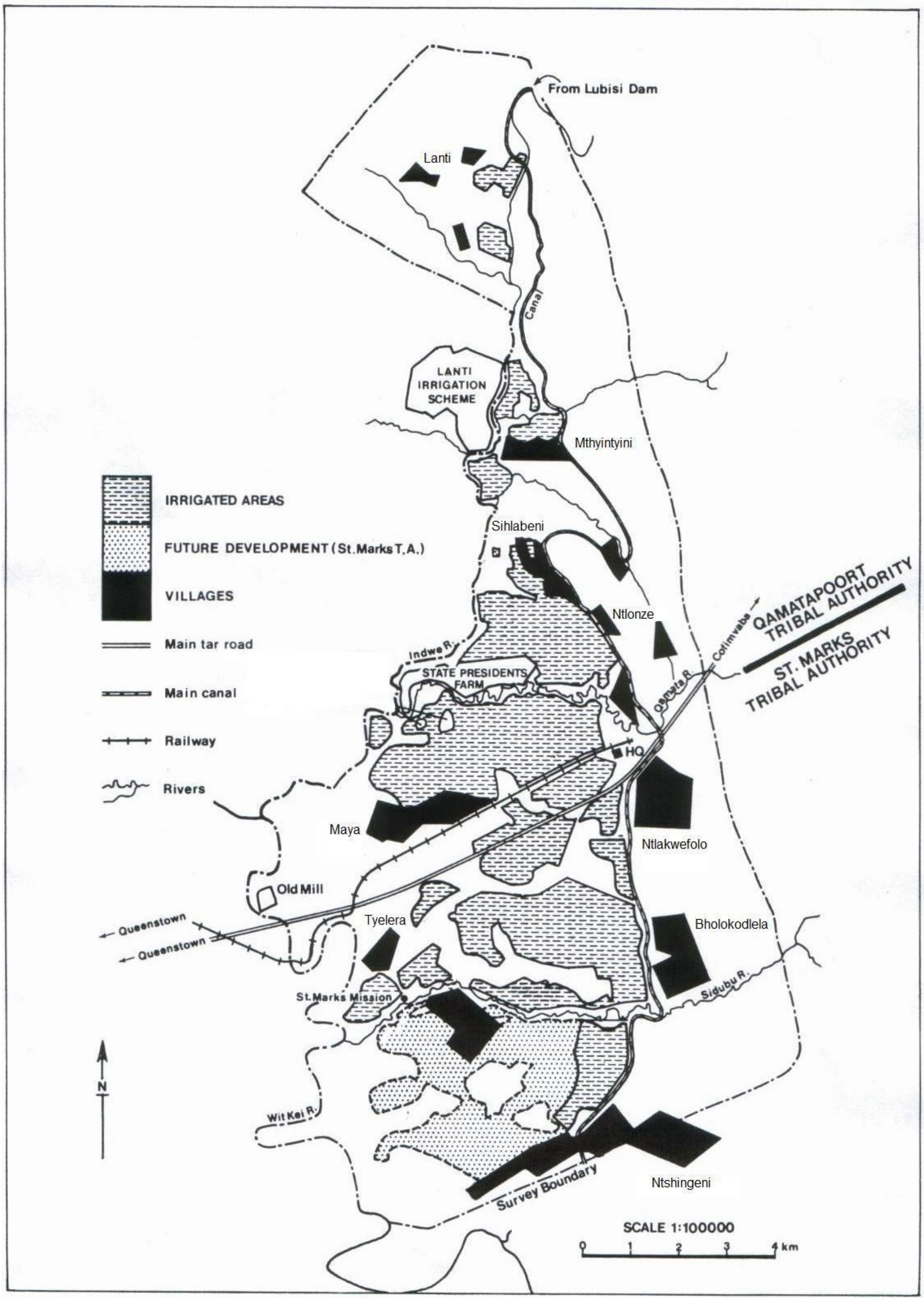

Figure 4.1 General layout of Qamata Irrigation Scheme (Republic of Transkei, 1986:2)

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[19] A substantial proportion of the records (e.g. minutes of meetings, official documents and correspondence) of QIS are either missing or misplaced. Therefore, the researcher had to secure some crucial pieces of information through personal communications, interviews and group discussions (see Chapter 5).

The Department of Bantu Development in the former Republic of South Africa sanctioned the development of QIS in the early 1960s (TRACOR, 1989:1). Accordingly, the Xhosa Development Corporation of the former self-governing Transkei commissioned Loxton, Venn and Associates to undertake feasibility studies, the objective of which was the development of the irrigation scheme at Qamata (see Section 2.10 of Chapter 2). As the then Chief Minister of Transkei and the Paramount Chief of Western Thembuland, Chief K. D. Matanzima initiated the construction of the Lubisi Dam which was completed in 1968. Although the QIS was established by the Xhosa Development Corporation, the project was financed by the South African government through the Department of Bantu Development. The total cost of the project including the dam, irrigation scheme and farmland was R175 million (Loxton, Venn and Associates, 1998:1). When Transkei was granted 'independence' in 1976, the scheme was handed over to the territory's Department of Agriculture and Forestry to manage.

The planning and control of QIS was centralised as recommended by Loxton, Venn and Associates. The participation of the local farmers in the initial planning, design and implementation phases of the project was extremely minimal. It reflected the centralised and authoritarian character of the homeland administration (see Section 3.7 of Chapter 3). The management of QIS determined the use of the irrigated fields and could evict non-performing farmers from their plots. However, as Bembridge (1986b:612) advised, the viability of irrigation schemes and the participation of the beneficiaries are directly related.

In 1982 the Transkei Agricultural Corporation (TRACOR) took over the direct management and administration of the scheme from the Department of Agriculture and Forestry. After a brief period, TRACOR relinquished the management of QIS in 1984 as the scheme's management and administrative functions were transferred to Inter-Science (Pty) Ltd., a subsidiary enterprise of Loxton, Venn and Associates (TRACOR, 1989:1). The need for managing agents that could apply private sector commercial methods was suggested by the Loxton, Venn and Associates who contended that, owing to excessive bureaucratic procedures, the Department of Agriculture and Forestry and TRACOR could not directly manage any serious production project (Republic of Transkei, 1978:5). However, in 1986 the Department of Agriculture and Forestry again requested TRACOR to manage the scheme on its behalf. Between the late 1986 and 1994 the scheme was managed by TRACOR with a work force of over 500 employees (Department of Water Affairs and Forestry, 2004:9-66). The majority of the employees were farm labourers who were assigned to Lanti Farm (the commercial section of QIS). The rest of the workforce was made up of technicians, water bailiffs, drivers and section managers and officials of TRACOR at the scheme. The farmers were not employed by TRACOR; they were self employed as they worked for themselves on the irrigated plots allocated to them (Personal communication, Mr Dhlangisa, the manager of QIS on 8 April 2008).

The Lanti Farm employed modern and capital-intensive methods of agricultural production consisting of a network of sprinklers, mechanized disc ploughs, planters, harvesters, sorting and grading plants and huge silos. Maize, lucerne and cabbage were planted on a commercial scale (TRACOR, 1989:1). Political instability in the former Transkei in the late 1980s and the closure of TRACOR in 1994 spelt the demise of the scheme (MBB Consulting Engineers, 2005a:1). The section that follows discusses the policy under which QIS was established and managed.

4.3 Irrigation policy at Qamata

The Plan Report Volume 1 of the Department of Agriculture and Forestry (Xhosa Development Corporation, 1967) and Qamata Development Plan (TRACOR, 1988) outlined the Qamata irrigation development policy. The two policy documents were based on Loxton, Venn and Associates' proposals. TRACOR's version of the irrigation policy is merely a synopsis of the earlier policy contained in the Plan Report Volume 1. TRACOR's version did not introduce new provisions to alter the orientation of the scheme towards sustainability. The focus of the irrigation development policy was to develop agriculture to ensure food security at Qamata and provide the basis for transformation of the local economy (Xhosa Development Corporation, 1967:97; TRACOR, 1988:1). The farming households were poor because farming operations could not even satisfy the food requirements of the households due to inadequate rainfall as explained in Section 1.5.1 of Chapter 1. The economic objective of the policy, characterized by the establishment of Lanti Farm, was to increase the value and volume of agricultural production of the area through irrigation farming. The social objectives included the creation of job opportunities and incomes as an alternative to outmigration. The salient issues raised by the irrigation development policy at Qamata relevant to the study are discussed below.

4.3.1 Land allocation and tenure

On land allocation, the policy proposed two categories of labour intensive farms for the local people (Xhosa Development Corporation, 1967:98; TRACOR, 1988:16).

(i) Food crop plots of 0.25ha to 2,5ha should be issued to the farmers who previously had (dry) land rights; the plots were to be held under traditional (communal) tenure.

(ii) Commercial farms of 5ha capable of being expanded to 10ha should be leased to selected men from the local community to be full time irrigation farmers. Each farm was to be provided with a house, store, fencing, irrigation water and equipment. The lease was subject to satisfactory performance. The policy clearly stated that each commercial farmer would have to employ permanent labour force.

As will be discussed in Chapters 6, 7 and 8, the land allocation and tenurial policies of QIS have had a profound impact on the livelihood strategies of both the food crop farmers and commercial farmers in particular and on the sustainability of the scheme as a whole.

The policy created the highly mechanized Lanti Farm of 225ha which was operated as a commercial unit and managed by a specialist agency on “no profit-no loss” formula (Xhosa Development Corporation, 1967:97). The aim of the Lanti Farm was to generate income for the development of the food crop entity of QIS (see Section 1.1.8 of Chapter 1). A Presidential Farm of 77ha

(Figure 4.1) was allocated to the former Paramount Chief (Chief K. D. Matanzima) and his family. The policy was however silent on the type of tenure under which the Lanti and the Presidential Farms were to be administered.

The policy set the immediate target net income for the commercial farmers at R940,00 per annum and R370,00 per annum for the traditional food plotholders (Xhosa Development Corporation, 1967:9a). Yet, it conceded that the expected income of the commercial farmers would not be attainable until processing plants were established to process their produce. The food crop farmers with irrigated plots were expected to produce food for their families and cash crops to generate incomes. In the case of the landless and the unemployed, since their levels of education and training were very low, the immediate objective, *inter alia*, was to create farming employment opportunities on the commercial farms and Lanti Farm which could provide them with acceptable incomes (Xhosa Development Corporation, 1967:10). Based on the predominant development paradigm in vogue, it was expected that the growth effects (e.g. improved farming methods and modern farming technology) of the scheme would spread to the nearby villages and districts (Lukhele, 1995:23).

The basis upon which the farmers were selected and plots allocated was purely tribal. The criteria were established by the Emigrant Thembuland Regional Authority and were rooted in patriarchal traditions and customs with little regard to economic viability and sustainability of the project (Southall, 1983:227). The plots were allocated by local chiefs and headmen in consultation with the local magistrate and project superintendent. Widows and unemployed people were allocated smaller garden plots: the aim was to provide subsistence for many people. The people who received wages, salaries and old age pension were excluded from the scheme (Southall, 1983:227). The farm units were too small to guarantee subsistence (see Section 8.3 of Chapter 8). The farm units favoured the families who had financial resources to succeed. Therefore, some of the less endowed settlers abandoned their holdings to look for employment elsewhere. The abandoned allotments and those of incompetent farmers were expropriated and reallocated to successful farmers. Those who were allocated irrigated plots forfeited their communal land rights to stem out conflicting interests in dryland and irrigation farming.

After 1994, the Lanti Farm, the Presidential Farm and the plots which were allocated to the local chiefs which in total consisted of 390ha of irrigated land were returned to the land right holders at Qamata (ARDRI, 1996:17). The current allotments for the food crop farmers range from 0,25ha to 2,5ha. It is estimated that over 40,0% of the irrigated land has more or less been abandoned by their owners as the plots have remained uncultivated for many years (Personal communication, Mr. Dingiswayo at QIS on 27 May 2005).

4.3.2 Farmer servicing and training

The irrigation development policy at Qamata targeted Lanti Farm to be the hub of the entire scheme. “It would have all the necessary facilities to service the producers” (Xhosa Development Corporation, 1967:99). Innovative farming ideas, processes and procedures were to be disseminated from Lanti Farm to the local farmers at the scheme. The producers (the food crop and commercial farmers) would be furnished with essential supplies including water, seeds, inputs, credit, extension service and training. The policy requested that the farmers should pay for everything they would be supplied with. The Lanti Farm was to provide an assured market for the produce of local farmers at the scheme.

The objectives of the scheme undermined the ability of the farmers to pay for the services they received from the scheme (see Section 8.2 of Chapter 8). The insistence on the production of food crops to ensure food security of the farming households meant that the smallholder irrigators lacked access to income to enable them to pay for inputs and other services the scheme provided them with.

Besides, the irrigation development policy at Qamata did not specifically provide for the transfer of irrigation technology to the smallholder irrigation farmers because capacity building in the realm of production, farm management and planning and marketing of produce did not feature anywhere in the two policy documents. The focus of attention of the planners of QIS was on the need to improve the material conditions of the farmers which was the practice of the time. Prior to the 1970s the term 'development' was traditionally defined in material (e.g. income) terms (Todaro and Smith, 2006:14-15). TRACOR should have inserted provisions for capacity building when it revised the irrigation development policy in 1988 as the focus of the definition of 'development' had by then shifted from the provision of material needs to the development of human potential (Owens, 1987:xv).

4.3.3 Organisational structure

The organisational structure of an irrigation scheme determines whether the project will be sustainable or not (MBB Consulting Engineers, 2005b:9; Bembridge, 1984:349). From an effective organisational structure emerges the control and discipline required for successful management. In accordance with the provisions of the Qamata irrigation development policy a management committee, known as the Controlling Board, was established to manage the entire scheme. The Controlling Board was composed of the Chief of Qamata area and selected advisors, headman and advisors, and representatives of the Department of Agriculture, the local farmers, the managing agents and Xhosa Development Corporation (which became known as the Transkei Development Corporation after 1976) (Xhosa Development Corporation, 1967:99). The Controlling Board held monthly meetings. It was the highest decision making body at the scheme.

Besides the Controlling Board, the policy provided for a consultative committee which was responsible for the day-to-day running of the scheme. It met weekly to review operations at the scheme and plan the following week's activities. It comprised the representatives of the managing agent (e.g. TRACOR or Inter-Science (Pty) Ltd) and the farmers. The entire scheme was centrally planned and managed successively by the Department of Agriculture, Inter-Science (Pty) Ltd and TRACOR (Van Averbeke *et al*, 1998:26; ARDRI, 1996:19). The control and management style up to 1994 was top-down. Although the local farmers bore the risk of production, they had little decision-making power (Vaughan, 1997:4). The farmers had no opportunity to acquire skills in planning, designing, implementation and management of smallholder irrigation. Therefore, the irrigation policy at QIS failed to lay the foundation for irrigation management transfer (IMT) (see Section 2.11 of Chapter 2).

The primary concern of the management was the success of Lanti Farm to justify the resources expended. The Lanti Farm was run separately by Inter-Science (Pty) Ltd and TRACOR successively with an "unwilling labour force" which repeatedly demanded openness and accountability (Department of Water Affairs and Forestry and Department of Agriculture, 1996:17). Labourers carried out the farming operations. The local farmers hardly knew what happened at Lanti Farm (Personal communication, Mr. Dingiswayo at QIS on 27 May 2005). Following political and constitutional negotiations in South Africa in the late 1980s and early 1990s the workers and farmers at QIS became agitative. Labour unrest and demands for higher remuneration and incentives that ensued eroded the authority of the management and administration of the scheme. The result was a drastic drop in productivity (Van Averbeke, 1998:4) which has persisted up to this day.

4.3.3.1 Post-apartheid management structures at QIS

In 1994 a Board of Control and Development was elected to take over the management functions of TRACOR at QIS (ADRI, 1996:19). The Board was composed of the representatives of the local farmers, chiefs and headmen and other stakeholders (e.g. the NGOs assisting the food crop farmers). The Board became the highest level of authority which formulated policies for the scheme. In 1998 the Board was replaced by the Qamata Trust as the topmost decision making body of QIS (Department of Water Affairs and Forestry, 2004:9-69). It was constituted by the representatives of the chiefs and headmen and all the income generating groups at QIS. The traditional leaders and headmen were not directly involved in the management of the scheme; however, they served on committees set up by Trust. The land on which the scheme is located is communally owned and was therefore administered by the Trust.

In 1999 a group of local business men and women from St. Marks Tribal Authority who were discontented by the performance of the Qamata Trust in particular and QIS as a whole established an organisation at the scheme called the Gcaleka Trust (Kula Development Facilitators, 2003:8). The Gcaleka Trust was dissatisfied with “the weak representation of the people by the Qamata Trust” (Kula Development Facilitators, 2003:8). The aim of the Gcaleka Trust was “to operate the scheme [QIS] as a viable business entity focusing on various agricultural enterprises” (Department of Water Affairs and Forestry, 2004:9-70). The emergence of the Gcaleka Trust threatened the hitherto peaceful socio-economic atmosphere at QIS as the Gcaleka Trust wrestled with the Qamata Trust for the control and management of the scheme (Department of Water Affairs and Forestry, 2004:9-70). The Gcaleka Trust claimed to own two-thirds of the land area at the scheme. However, according to Kula Development Facilitators (2003:9), “the legitimacy of Gcaleka Trust is difficult to measure”. As a result of the confusion and instability that ensued, a plan to establish a chicory processing plant at Qamata was withdrawn. Besides, a number of pledges of financial support has also been withdrawn (Department of Water Affairs and Forestry, 2004:9-70).

Under the auspices of the Provincial Department of Agriculture a new management structure called the Producers Assembly was formed in 2007 to manage and control the Qamata Irrigation Scheme (Personal communication, Mr N. Kaba, the resident representative of Department of Agriculture (DoA) at QIS on 8 April 2008). It is a compromised management structure composed of members of Qamata and Gcaleka Trusts, representatives of DoA, five representatives of the farmers from each of the six sections of QIS (see Section 4.3.4 of this chapter) and three officials from the scheme. The various institutions which are represented in the Producers Assembly enjoy equal rights, privileges and authority. It is by consensus only that the Producers Assembly can take policy and management decisions (Personal communication, Mr N. Kaba on 8 April 2008). The extension officers regard the current bottom-up system of management as inappropriate[20]. They argue

[20] The researcher obtained this information at a group discussion with extension officers at QIS on 2 September 2005 (Appendix 7, item 16).

that since the early 1990s attempts to involve the local community (workers, farmers, chiefs and headmen) and other stakeholders in management have had disastrous impacts on productivity due to delays caused by consultations and negotiations. They suggested a combination of both top-down and bottom-up approaches into a unique blend which apportions greater decision and policy making powers to those who bear the brunt of the policies and decisions at QIS, namely, the scheme's officials and farmers. What is noteworthy about the post-apartheid management of QIS is that no specific effort has to date been made to transfer irrigation technology to the smallholder irrigators via a training and skills development programme (see Sections 7.9.3 of Chapter 7 and 8.4 of Chapter 8).

4.3.4 Land use

For administrative purpose, QIS was divided into six sections (numbered from 1 to 6) right from its inception. Each section has a specific number of farmers (see Section 5.5.1 of Chapter 5) and an operational centre. The scheme was designed for arable farming only (Xhosa Development Corporation, 1967:98; TRACOR, 1988:16) although the settlers have always been allowed to keep livestock. The farming systems of the food crop and commercial farmers were determined by the Controlling Board; initially inter-cropping was strictly prohibited at the scheme. The production manager was the head of the managing agent (either Inter-Science (Pty) Ltd or TRACOR) at the scheme and was in charge of all production and marketing functions. The scheme's headquarters were established at Qamatapoort.

Under the current system of management, it is the emerging commercial farmers whose land use practices are controlled by the management of the scheme as they are encouraged to produce crops such as cabbage and maize on a large scale for sale (Personal communication, Mr N. Kaba, at QIS on 8 April 2008). The food crop irrigation farmers use their plots with little interference and supervision from the scheme's management. They cultivate local staples such as maize, cabbage, potatoes, beans and a variety of vegetables. Some food crop farmers practise inter-cropping where a number of local staples are planted.

4.3.5 Infrastructure

Infrastructure refers to the facilities that are indispensable to a modern system of irrigation farming, e.g. roads, canals, lei dams, workshops, offices and office equipment, agricultural machinery and storage facilities. The Qamata Irrigation Scheme was developed as a showpiece in irrigation farming. In the late 1960s when the scheme was commissioned it had adequate infrastructure to perform the expected functions and tasks (Qamata Trust, 2000:7). The existing network of roads at QIS was retained and improved. Additional roads were constructed to link the headquarters, operational centres and the irrigated fields. The headquarters consisted of an office block, range of stores, garages, workshops, ablution, a clinic and silos. A staff village with recreational facilities was built for the workers. Telephone, telex and radio communication facilities were established at the scheme. At its inception, QIS had an impressive pool of agricultural machinery including tractors, ploughs, planters and harvesters (Department of Water Affairs and Forestry, 2004:9-75). The scheme still gets its supply of electricity from the Ncora hydro-electric power plant. Prior to 1994, the project engineer was responsible for all construction and maintenance work at the scheme.

Under the current system of administration, infrastructure is not properly maintained (see Section 6.4.8 of Chapter 6). For example, the gravel roads are impassable, the staff village is abandoned and vandalized and so are some of the workshops and garages. The Qamata Trust contended that “most of the items have deteriorated over the years through neglect and disuse and most of the vehicles, tractors and implements are unserviceable and are probably of scrap value only” (Qamata Trust, 2000:8). With the withdrawal of the government’s direct engagement, the position of the project engineer has virtually been abolished at the scheme because the position has not been filled since 1996 (Personal communication, Mr Dhlangisa at QIS on 8 April 2008). Although deterioration has occurred over time, some of the infrastructure is in a reasonable working order. It includes 10 ploughs, 7 trailers, 1 road grader, 1D7 Cat bulldozer, 4 grain silos and 1 grain drier. Besides, four giant centre pivots, each capable of irrigating 55ha of land, have been installed at Section 6 of QIS (Department of Water Affairs and Forestry, 2004:9-75).

The kind of infrastructure that has been conspicuously absent at QIS since its inception includes laboratories, training centres and equipment for training and transferring irrigation skills and technology to the smallholder irrigators.

4.3.6 Water management and irrigation scheduling

One of the major tasks at QIS is the conveyance of water from the Lubisi Dam to the irrigated plots as efficiently as possible in order to ensure smooth and unimpeded farming operations. Under the management of Inter-Science (Pty) Ltd and TRACOR, the water management and scheduling function was the responsibility of the Irrigation Controller who was assisted by six water bailiffs. A water bailiff was responsible for controlling water use on approximately 500ha of land (Xhosa Development Corporation, 1967:158). The water bailiffs were employed by the managing agents in consultation with the Controlling Board. Irrigation scheduling was strictly controlled and observed: when to irrigate crops and the amount of water to apply were determined by the water bailiffs according to a time table approved by the Controlling Board.

The flood irrigation system was designed to be used by the smallholder irrigators. Each section of the scheme has its own canal system and lei dams. A network of furrows conducts water from the lei dams to the irrigated fields. Water valves and orifices are used for controlling the flow of water to the individual plots. Each plot has a system of smaller furrows which distributes water across the plot. The smaller furrows are bordered by beds measuring on the average 137m long and between 3,6m and 10,6m wide (Department of Water Affairs and Forestry, 2004:9-68).

As discussed in Section 2.6 of Chapter 2, the National Water Act of 1998 places water management and irrigation scheduling under the direct supervision and control of the Qamata Water Users' Association (WUA) which consists of twenty members. Under Qamata Trust's management, the Qamata WUA was not properly constituted because the members of the

Qamata WUA were the same people who constituted membership of the Qamata Trust (Denison and Manona, 2007:46). At QIS the WUA is represented at the farm level by a lei dam committee which is responsible for water supply and the maintenance of in-field irrigation infrastructure. Each lei dam supplies approximately twenty irrigators with water. (Department of Water Affairs and Forestry, 2004:9-68). The members of the Qamata WUA are drawn from the six sections of the scheme. The National Water Act of 1998 empowers the Qamata WUA to generate revenue for the purpose of carrying out its legal mandate. Thus far, it has proposed that each irrigator pays a total of R216,00 per ha per annum for water usage. Presently the WUA does not function because there are no financial resources from DWAF to fund its development and operation (Personal communication, Mr Dhlangisa, at QIS on 8 April 2008). Instead, DWAF has employed six local people to manage the supply of water to the irrigated fields. The farmers therefore do not pay for the use of water. Indeed, since the inception of QIS the smallholder irrigators have had free access to water for irrigation and other uses. The practice has resulted in an inefficient use of water at the scheme. Because water is free, there is little or no incentive for the farmers to expend their resources and time to conserve and use it judiciously. In addition, crops (especially lucerne) of inferior quality were produced (ARDRI, 1996:8).

The farmers blame the shortage of water at the scheme on poor water management and control. It appears the irrigation control system does not function as planned because the ‘water bailiffs’ charged with the responsibility of opening and closing water valves do not observe the irrigation scheduling time table. At a group discussion, the farmers expressed the wish to maintain the canals supplying their plots with water themselves but they lack the necessary expertise and resources[21]. The use of inappropriate tools by the farmers to regulate water supply has resulted in breakages of some of the water valves and conditions of waterlogging on some irrigated plots (ARDRI, 1996:32). The impression one would have got from a visit to the irrigated plots in 2005 would have been that of neglect and poor water management. In

[21] The researcher obtained this information at a group discussion with irrigation farmers on 5 September 2005 at QIS (Appendix 8, item 23(b)).

Section 3 of the scheme, for example, 91 out of the 548 irrigated food plots were waterlogged and abandoned (Personal communication, Mr. Dingiswayo on 3 September 2005). The water management and control situation has not improved as most of the canals which convey water to the plots are still either broken because of erosion or are blocked by debris (Personal communication, Mr N. Kaba, at QIS on 8 April 2008). What this observation implies is that the water distribution and surface drainage systems are not properly maintained. Most of the lei dams are choked with sediments and plants (Plate 4.1).

Plate 4.1 Plants growing in a lei dam at Ntlakwefolo

4.3.7 External support

The open door policy[22] of the Producers Assembly permits the scheme to solicit and accept assistance from donors, including government departments, parastatals and private institutions and enterprises. With the withdrawal of direct financial support from the government, donors are a major source of resources such as skilled manpower, funds and equipment (Department of Water Affairs and Forestry, 2004:9-75). In 2004, the Electricity Supply Commission (ESKOM) and Chris Hani District Municipality together donated four units of centre pivot irrigation infrastructure installed at Section 6 of QIS. The Department of Water Affairs and Forestry has offered to provide expertise and funds to assist the WUA at Qamata to rehabilitate the bulk water infrastructure at the scheme. The other major donors include Independent Development Trust (IDT), Eastern Cape Development Agency (ECDA) and

[22] The policy which grants access to both public and private sector institutions and organisations to donate and invest at QIS.

the Office of the Premier of Eastern Cape (Department of Water Affairs and Forestry, 2004:9-74).

4.4 Farm management and practices

Irrigation farming at Qamata was heavily subsidized prior to 1994 when the scheme was managed successively by the Department of Agriculture, Inter-Science (Pty) Ltd and TRACOR. Approximately 60% of the cost of inputs and agricultural implements and machinery for most field operations were subsidized by the state (ARDRI, 1996:8). An unintended consequence of the heavy farm subsidies at QIS was low quality and volume of yield because inputs appeared to be cheap and were not used judiciously. The quality and volume of yield is a reflection of the skill, amount of labour and capital input by the farmer. Seemingly, the institutional arrangements at the scheme failed to stimulate human resource and entrepreneurial development among the irrigators to enable them to take advantage of the farm subsidization programme (Vaughan, 1997:4). Decision-making pertaining to issues such as crop choice and cultivation practices were the prerogative of the scheme's managing agents.

TRACOR adopted a different farm management approach from 1986 onwards when it took over the management of QIS from Inter-Science (Pty) Ltd. Most of the farm operations (ploughing, sowing, weeding and application of fertilizers and insecticides) on the smallholder irrigated plots were undertaken by TRACOR on behalf of the farmers. All that the farmers did was to harvest the crops, sell the harvest and pay TRACOR for the services[23]. In effect, TRACOR groomed a generation of lazy farmers whose responsibilities and functions were limited to harvesting and sale of the harvest.

Irrigation farming is more demanding than the traditional dryland farming. The availability of water for planting throughout the year means that labour is constantly needed to control and manage water, control weed and pest infestation and to monitor market conditions. It thus requires a high sense of

[23] The researcher obtained this information at a group discussion with irrigation farmers on 5 September 2005 (Appendix 8, item 29).

discipline on the part of the farmer to attain high yields and productivity (Groenfeldt, 2005; FAO, 2004). Besides, in poor communities which lack resources and expertise, the success of food crop irrigation farming depends on institutional and management support. Given this, when the subsidization of farmers ceased and state support was withdrawn after 1994 with the closure of TRACOR, the food crop farmers and the so-called emerging commercial farmers turned away from the production of cash crops (e.g. lucerne and hemp) to the production of food crops such as maize, cabbage, potatoes and other vegetables to produce food for their households (Personal communication, Mr. Dingiswayo at QIS on 12 September 2005). The food crop farmers and the emerging commercial farmers, who are natives of Qamata, justified their interest in food crop farming on the grounds that since local staples are grown it is always easier and quicker to dispose of surplus produce locally[24].

4.4.1 Research

A research and development unit was established in the early 1970s at QIS on a 6ha experimental plot referred to as Millsite (ARDRI, 1996:27). The unit was an integral part of the scheme; it was indeed seen as a prerequisite for long-term success of the irrigation project. It pursued an applied research programme that directly related to the problems and potential of the scheme. For example, it conducted a number of trials on the experimental plot to select the varieties that best suited farming conditions at Qamata. It also gathered data on suitable cultivars and optimum production techniques. The outcomes of research projects were usually passed on directly to Lanti Farm and later to the food crop and commercial farmers via the extension service. However, the wide gap between the yields realized on Lanti Farm and those obtained by the smallholder irrigators is partly blamed on the inherent bias in the priority of the research and development unit as most of its findings were modelled on a commercial farming approach. Moreover the problems and resources of the local farmers were not adequately analyzed and understood (Personal communication, Mr Dhlangisa at QIS on 8 April 2008). Hence the research efforts and findings were not very relevant for practical agricultural

[24] The researcher obtained this information at a group discussion with irrigation farmers at QIS on 5 September 2005 (Appendix 8, item 2).

development in the local farming community. As Chambers (1982:31) contends, research for agricultural development in rural areas should be designed for the sole purpose of developing technology to solve specific rural farming problems.

The research and development unit could not generate enough funds to cover its operation and maintenance costs and had to rely on state grants and subsidies. It was eventually disbanded after 1994. At present, there is virtually no organised research activity or unit at the scheme. However, the extension service of the Department of Agriculture and some private retail companies often organise field demonstrations and exhibitions for the local farmers[25].

4.4.2 Extension service

From the perspective of the irrigation development policy, both the food plot and commercial farmers at QIS have equal access to extension service. The team of extension staff links the research institutions in South Africa and elsewhere and the farmers at the scheme. Given the role of the extension service, it is important that the extension officers are adequately trained and equipped to carry technological information as accurately as possible to the farmers and feedback to the researchers. In a small-scale farming community where illiteracy is widespread (see Section 6.2.5 of Chapter 6), extension service remains a crucial factor for the adoption and application of modern methods of agricultural production, especially in irrigation farming. Mashaba (2000:7) contends that high quality "extension service will enable small-scale farmers to engage in agricultural production as entrepreneurs". This hope is yet to be realised at QIS.

According to Loxton, Venn and Associates (1998:4) the extension services offered under the management of Inter-Science (Pty) Ltd was of the highest quality. At each point in time Inter-Science (Pty) Ltd maintained not less than thirty-two extension officers at the scheme. Loxton, Venn and Associates

[25] The researcher obtained this information at a group discussion with extension officers at QIS on 2 September 2005 (Appendix 7, item 19).

(1998:4) succinctly asserts that most of the extension officers were trained in agricultural institutions in South Africa and not in the former homelands, emphasizing the quality of the extension staff that Inter-Science (Pty) Ltd employed at QIS. The standards and quality of extension services deteriorated sharply during the 1980's: the training provided for the farmers was not only inadequate, but the trainers themselves needed to be trained (Loxton, Venn and Associates, 1998:4).

Under the current system of management, there are eight agricultural extension officers permanently assigned to the scheme by the Department of Agriculture. An extension officer is assigned to each of the six sections of the scheme; however, Section 6 of the scheme has two additional extension workers for its sheer physical size. They advise farmers on crop production, including the selection and use of seeds and fertilizers, the best times for planting and harvesting, and the control of insects and pests. In some instances, they organise tractors and other essential services for the farmers in their respective sections. As will be discussed in Section 7.8 of Chapter 7, in terms of the size of QIS and the state of the scheme's infrastructure, eight extension officers are too few to provide effective services to enhance the productivity of the smallholder irrigation farmers.

4.4.3 Institutional support

The institutional and organisational support and services that the smallholder irrigation farmers at QIS enjoyed until 1994 were limited as a greater part of the scheme's resources was allocated to Lanti Farm. The support included readily assured market, subsidized inputs, access to credit facilities, pricing policies, free access to water for irrigation, access to land, agricultural education, research and advisory services. These services are required for the development of smallholder irrigation farming as they augment the productivity of the farmers (Vaughan, 1992:421). According to Loxton, Venn and Associates (1998:2), access to institutional support "assists the farmers to graduate from subsistence agriculture to commercial agriculture".

The withdrawal of the government from direct engagement in irrigation farming has created an institutional vacuum which has in turn limited the access of irrigation farmers to essential support and services (see Section 8.10 of Chapter 8). Owing to endemic poverty, the local farmers at QIS cannot procure these services on their own. Even some of the services, by their nature, are best provided by institutions, for example, pricing policies, credit, farmer education and advisory services. It is therefore not surprising that the productivity of the farmers dropped sharply when the services of TRACOR to the irrigation farmers at QIS were terminated after 1994 (Shah *et al*, 2000:40). Inputs such as fertilizers, seeds and pesticides procured via Department of Agriculture and cooperative societies are subsidized but the magnitude of the subsidy is smaller than those the farmers enjoyed under TRACOR (Personal communication, Mr N. Kaba at QIS on 8 April 2008). Moreover, QIS receives some assistance from donors (see Section 4.3.7 of this chapter).

4.5 Methods of farming

As discussed in Section 2.10 of Chapter 2, Loxton, Venn and Associates recommended a capital-intensive method of farming on Lanti Farm where ploughing, planting and harvesting and other farming operations were mechanized. The commercial and food crop farms operated by the smallholder irrigation farmers have always been labour-intense: besides, ploughing, the rest of the farming activities are undertaken by hand and a flood irrigation system conveys water to their plots.

4.5.1 Use of manpower, animal draught power and machinery

As no foundation was laid to orientate the local farmers towards modern agricultural production all the food crop farmers at QIS are engaged in subsistence farming. In a survey conducted by ARDRI in November 2002 in Section 2 at QIS, it was revealed that a high proportion of the people rely on the government's social welfare grants such as pensions and as much as 64% of the respondents are unemployed (ARDRI, 2002). It appears that the flood irrigation farming does not generate enough food, income and employment opportunities. The farmers encounter problems of poverty and shortages of inputs, agricultural machinery and other implements. In effect, years of hard work at the scheme as irrigation farmers have not put them in a position to acquire the necessary implements to improve the scale and methods of farming. The smallholder irrigation farmers attribute poor harvest to late planting owing to the shortage of tractors which delays land preparation which precedes planting[26].

Notwithstanding the level of poverty and the shortage of agricultural machinery, implements and farm labour, the use of animal powered implements is conspicuously absent at the scheme (Personal communication, Mr Dhlangisa at QIS on 8 April 2008; see Section 7.3 of Chapter 7). However, animal draft power is used for most agricultural operations throughout South Africa. As has been observed by Fowler (1999:269), animal draft power "is used by possibly 40% of South Africa's 1.3 million functional rural households (including a number of large-scale commercial farmers) and its wide and more efficient adoption could markedly increase incomes and stabilise rural communities … it is by far the most economic and environmentally friendly source of power". The irrigation farmers at Qamata prefer the use of machinery (e.g. mechanical ploughs and planters) to the use of simple but cost effective and time and labour saving animal powered implements, a culture bequeathed to them through the use of sophisticated agricultural machinery by the managing agents (Inter-Science (Pty) Ltd and TRACOR Ltd) at Lanti. They associate the use of animal draft power with backwardness (Personal communication, Mr Dhlangisa at QIS on 8 April 2008). To them modernity in the agricultural sector means the use of tractors and other agricultural machinery which use fossil fuel. However small-scale farming does not warrant mechanization; owing to the small size of farms, most of the agricultural machinery is not efficiently utilised.

Since both government and private agricultural machinery hire services in the area have been unreliable, the majority of the farmers rely on the old practice of a work-party to provide labour for the most pressing farm operations such as hoeing and harvesting. Under the work-party system, the host slaughters a

[26] The researcher obtained this information at a group discussion with irrigation farmers at QIS on 5 September 2005 (Appendix 8, item 20).

sheep or pig, prepares local beer and invites community members to assist him or her to perform a specific task on the farm in exchange for the food and beer[27]. At a group discussion the participants were divided over the efficiency of the work-party system: whether it is more efficient in terms of cost and time to hire labour to get a specific task done, or to organize a work-party to get the task performed[28].

4.5.2 Methods of weed control

The general impression drawn from visits to seven randomly selected cultivated fields at QIS on 13 and 14 September 2005 is that not all the farmers control weeds on their holdings or do so at the right time. This observation reflects the views of the extension officers about weed control on smallholder irrigation farms at QIS[29]. The extension officers claim that the use of herbicides is more efficient in terms of cost and effectiveness, but their use requires training and significant levels of literacy and numeracy, which a considerable proportion of the farming community lacks. According to the extension officers, dry ploughing in winter can eradicate certain types of weed notably *Cynodon dactylon*; the problem, however, is that most farmers are reluctant to plough their fields in winter. Hoeing is the most popular form of weed control. Only a small number of commercial irrigators use herbicides and biological control of weeds and alien plants is virtually unknown at the scheme (see Section 7.6 of Chapter 7).

4.5.3 Control of insects and pests

Aphids, cutworms and maize stalk borers are the pests whose names featured prominently in discussions with irrigation and dryland farmers[30]. They are recognized as one of the major constraints on agricultural production as they reduce yields of the staple food crops, namely, maize and cabbage. The

[27] The author had the privilege to attend a work-party at Ntlakwefolo on 27 May 2005 to harvest maize.
[28] The researcher obtained this information at a group discussion with irrigation farmers at QIS on 5 September 2005 (Appendix 8, item 20).
[29] The researcher obtained this information at a group discussion with extension officers at QIS on 2 September 2005 (Appendix 7, item 11).
[30] The researcher obtained this information from group discussions with irrigation farmers on 5 September 2005 (Appendix 8, item 22)and dryland farmers on 7 September 2005 (Appendix 9, item 21).

concentration of attention and effort on the three pests shows that the economic significance of the other pests under the prevailing farming conditions is not adequately understood. Amongst the food crop farmers at QIS, pest management is a built-in practice in the overall crop production and not a separate well-defined activity. The dryland farmers and quite a limited number of irrigation farmers practised inter-cropping (where different crops are grown on the same plot at the same time). The farmers believe that the practice reduces the incidence of pest infestations[31], a notion shared by eminent researchers such as Abate, van Huis and Ampofo (2000:631-632) and Rämert, Lennartsson and Davies (2002:207). However attempts are made to destroy pests and insects when signs of infestation emerge and the threat to yield becomes obvious. The main control method for insects and pests is the application of insecticides and pesticides (see Section 7.5 of Chapter 7). On the commercial farms where monoculture is the norm rather than the exception, insecticides and pesticides are more frequently applied.

4.5.4 Application of fertilizers

Continuous cultivation of irrigated plots over the years causes the soil to lose its fertility. Plant nutrient exhaustion presents a formidable threat to food security and rural livelihoods. The application of fertilizers offers greater potential for achieving sustainable increases in food production and rural incomes through intensive cultivation (Saleem, Javed, Ali and Ullah, 2003:1229; Kelly, Reardon, Yanggen and Naseem, 1998:1). The proper use of balanced fertilizers on soils of low natural fertility makes it possible to plant a wider variety of crops with amazing success. As will be discussed in Section 7.4 of Chapter 7, the extension officers at QIS usually recommend an all-purpose fertilizer (mainly 3.2.3[32]) because it is suitable for cabbage, maize and most vegetables. Kraal manure is used on a limited scale and the quantity applied per hectare is too low to produce any appreciable benefits (Personal communication, Mr. Dingiswayo on 3 September 2005). Farmers' knowledge is essential to successful application of inorganic fertilizers

[31] The researcher obtained this information at a group discussion with extension officers at QIS on 2 September 2005 (Appendix 7, item 10).
[32] 3.2.3 indicates the proportions of nitrogen, phosphate and potassium respectively in the fertilizer.

because accurate timing and recommended doses are necessary to guarantee the expected high output (Saleem *et al*, 2003:1230). The extension officers at Qamata regard the inefficient use of fertilizers as one of the most important constraints on crop growth[33].

4.5.5 Soil conservation

There is little erosion on the irrigated fields at the scheme because of a fairly flat gradient. In severely eroded areas, such as the dryland farms on the steep slopes in the villages surrounding the scheme, crop yield is reduced. Soil erosion does not only affect the farmlands where the erosion takes place, but also the lei dams and rivers where the sediments are deposited (ARDRI, 1996:8). It is therefore understandable that soil conservation practices have been instituted at the scheme and in the surrounding villages. Contour ploughing, as a soil conservation measure, has been enforced in the entire district of Cofimvaba by the Department of Agriculture since the days of betterment planning (see Section 3.4.3 of Chapter 3). Soil conservation in South Africa has historically focused mainly on prevention of soil erosion rather than on effective maintenance and use of soil (Mills and Fey, 2003:429). What has brought soil erosion in check at QIS is the flat gradient which is the consequence of the application of irrigation technology. Irrigation farming demands that the landscape be levelled to ensure equitable distribution of water in the irrigated fields under the force of gravity.

4.5.6 Yields

Yields of staple food crops (e.g. maize and cabbage) are higher at the scheme than in the surrounding villages where dryland farming is practised (Personal communication, Mr. Dingiswayo on 3 September 2005). It is estimated that maize yield per hectare at the scheme is approximately 4 tons which compares favourably with that of dryland farming estimated as ranging between 1.1 tons per hectare and 1.8 tons per hectare. The extension officers are convinced that maize yield of 6 tons per hectare could be achieved if the

[33] The researcher obtained this information at a group discussion with extension officers on 2 September 2005 (Appendix 7, item 9).

farmers could spend a little more on inputs, especially on fertilizers[34]. Cabbage yield is exceptionally high; yields between 30 000 and 35 000 heads per hectare were reported by the extension officers at the group discussion. However the yields of potato, pumpkin and other vegetables are estimated as being well below the potential of the scheme.

Recent studies blame low and declining agricultural yields on lower use of skilled labour, capital and fertilizers per hectare (Chopra, 2004:28-29). The shortage of labour is partly attributed to the effects of HIV/AIDS and partly to out-migration of the youth which limits the availability of labour for crucial tasks (such as weeding) which in turn impact negatively on yields. In addition, Chopra (2004:29) believes that the low output of female farmers is due to "unequal rights and obligations within the household, as well as limited time and financial resources. Given equal access to resources and human capital, women farmers can achieve equal or even, as some studies show, significantly higher yields than men."

4.6 Rehabilitation of Qamata Irrigation Scheme

In 1998 Loxton, Venn and Associates (1998:1) stressed the need to rehabilitate the entire infrastructure and equipment at QIS. The existing infrastructure had deteriorated over the years: the buildings, workshops and storage facilities and the network of gravel roads through and around the scheme required urgent attention in order to improve productivity. The flood irrigation system at QIS needed to be replaced. It was not efficient in terms of water loss. Besides, the soil is not suited to flood irrigation as the practice led to waterlogging conditions. According to the Rural Development Services (2003:7) the deteriorating condition of the existing flood beds and concrete canals in Sections 1 and 5 of the scheme suggests that the irrigators find it extremely difficult to maintain the flood irrigation system. The architects of the system, Loxton, Venn and Associates, advised that the system would have to be replaced with a more efficient system such as overhead sprinklers in the course of time (Loxton, Venn and Associates, 1982:41). However, the old

[34] The researcher obtained this information at a group discussion with extension officers at QIS on 2 September 2005 (Appendix 7, item 9).

flood irrigation system is still in use at the scheme except in Section 6. As indicated in Section 4.3.7 of this chapter, with the assistance of donations from Eskom and the Chris Hani District Municipality, four modern units of centre pivot irrigation infrastructure for overhead sprinkler irrigation have been installed at Section 6 of the scheme. In 2002, the Department of Water Affairs and Forestry initiated a long-term rehabilitation programme to upgrade the bulk water supply system consisting of lei dams, balancing dams and water canals (Rural Development Services, 2003:4). Because the rehabilitation of the irrigation system requires huge financial resources it would have been particularly helpful to the farmers if the rehabilitation process was completed before the management of the scheme was transferred to the smallholder irrigators.

4.7 Summary

An irrigation system is a physical infrastructure which captures, stores, transports and distributes water to cultivated fields (Horst, 1998:16). It is exceptionally useful in areas which experience uncertainties in agrarian conditions due to vagaries in amounts and distribution of rainfall because it ensures that water is readily available throughout the year for intensive crop production. It is thus not surprising that in 1955 the Tomlinson Commission recommended irrigation agriculture as the most prudent means of alleviating poverty and unemployment in the former homelands in South Africa (Commission for the Socio-Economic Development of the Bantu Areas within the Union of South Africa, 1955:121).

Following the publication of the report of Tomlinson Commission, the Qamata Irrigation Scheme was established in the late 1960s to alleviate the problems of poverty, unemployment and food insecurity. To the disappointment of the political and planning authorities who wanted to demonstrate the efficacy and effectiveness of Bantustan independence and governance and the beneficiaries who wanted to improve their socio-economic conditions, the Qamata Irrigation Scheme failed to achieve its intended objectives. It has performed far more poorly than the irrigation schemes established in the white rural areas during the Great Depression in the 1930s.

The exclusion of the farmers at Qamata from the development of the scheme is blamed for its dismal performance (Republic of Transkei, 1991:263). The irrigation development policy was formulated with the assistance of an outside consulting firm, viz Loxton, Venn and Associates. The interests and aspirations of the intended beneficiaries were not fully integrated into the policy. The fundamental policy which shaped and directed the irrigation development process at Qamata was thus not well informed. Certainly, the inherent weaknesses in the irrigation development policy might have influenced the extent to which irrigation technology could be transferred to the smallholder irrigation farmers and the sustainability of the Qamata Irrigation Scheme as the scheme ground to a halt when the government withdrew its direct involvement and financial support in the 1994. Up to now, the efforts to revamp QIS have been thwarted by local politics (see Subsection 4.3.3.1 of this chapter), weak institutional support and services and the lack of production and entrepreneurial skills on the part of the smallholder irrigation farmers.

The chapter which follows presents the methodological aspects of the study. Besides spelling out the methodological framework of the study, the chapter offers an insight into and the rationale for the data solicited, methods of data collection, sample design and the statistical models of data analyses.

CHAPTER 5

RESEARCH METHODS

5.1 Introduction

The range of research methods and techniques used in the course of this study and the methodological issues that emerged are presented in this chapter. The purpose of the chapter is to offer theoretical and empirical foundations for the various methods used. The study of public policy is an interdisciplinary endeavour (Wildavsky, 1979:15). Most public policies cut across a wide range of social fields. Development policies, for example, are a mix of political, economic, administrative, geographical and historical issues. Therefore, in order to perform a comprehensive and insightful analysis of the rural development policy with a focus on the transfer of irrigation technology at Qamata, as will be presented in Chapters 6, 7 and 8, it is necessary to draw on a number of social aspects and approaches to solicit and analyse the required data. As a result an eclectic research strategy was adopted. The strategy made it possible to incorporate both measurable and non-measurable social phenomena in the study and allowed the use of quantitative and qualitative approaches.

The first part of the chapter discusses the theoretical basis of the research methods to facilitate easy understanding of the outcome of the survey and conclusions thereof. The aim is to dispel any notion or suspicion that the account produced in the end is a one-sided accentuation of aspects of reality in order to detect causal relationships (Weber, 1949:90). The application of the case study approach to social investigation in this study is explained in the second part of the chapter. The research design and the methods of data collection and analysis are presented in the final part of the chapter.

5.2 Methodological framework

Owing to the eclectic nature of this study, the research design and methods of data collection were rooted in the philosophical assumptions of both positivism and post-positivism. Philosophical assumptions have a profound influence on research design and the choice of methods of data collection (Myers, 1997:241). According to Trout (1998:4), the primary source of knowledge about the social world is constituted by a combination of both observable/measurable and unobservable/non-measurable social phenomena. As will be illustrated in Chapter 7, the application of positivist philosophical assumptions enables the study to identify and analyse cause-and-effect relationships between the irrigation technology transfer policy at Qamata and the alleviation of poverty, household food insecurity and unemployment with the aid of statistical analyses of the data solicited through the questionnaire survey. The causal relationships will be used, among other factors, in Chapter 8 to examine the effects of the irrigation technology transfer policy at Qamata. However, this study did not seek to formulate universal social laws or generalizations, one of the main distinguishing features of positivism (Trochim, 2002; Trout, 1998:3; Hammersley and Gomm, 1997:2.8).

The use of post-positivist philosophical assumptions permits the inclusion of unobservable/non-measurable social phenomena such as thoughts, aspirations and values in the study. As will be discussed in Sections 5.6.2 and 5.6.3 of this chapter, the data on the unobservable/non-measurable social phenomena will be solicited via interviews and focus group discussions. Trochim (2002) contends that although these social factors cannot be directly observed, they give meaning to human behaviour in the field of development and some of their physical and physiological accompaniments can be observed and measured.

The use of multiple sources of data in this study (see Section 5.6 of this chapter) is justified by a key proposition of critical realism. Critical realists hold the view that because all measurements and observations are fallible, it is important to have multiple measurements and observations in a social survey. The use of triangulation across these measurements and observations generates a more accurate picture of social reality (Trochim, 2002). The proponents of post-positivist critical realism, Mäntysaari (2002), Bhaskar

(2000; 1997), Sayer (2000; 1984) and Putnam (1992), propose that the epistemic perspective is ideal for social research and analysis because it ensures flexibility and dynamism in research methodology to cater for ever-changing social structures and perceptions. The flexibility and dynamism that Rondinelli (1993:17-18) calls for in development policy research is therefore taken care of by post-positivist critical realism. Besides, the epistemic perspective gives much thought to issues such as the power relations, history and other social circumstances (as discussed in Chapter 3) because it perceives social reality as a constellation of mechanisms, structures and contexts (Trochim, 2002). The critical realist approach is thus employed in this study to assess the effects of irrigation technology transfer policy at Qamata within the socio-economic realities of the Eastern Cape Province in particular and South Africa in general.

The methodological framework is not strictly rooted in the post-positivist critical realism to the exclusion of other perspectives. The strengths of various perspectives are incorporated in the study. However, the methodology leans towards the direction of post-positivist critical realism for the reasons discussed above. The choice of the methodological strategy for the study was guided by Silverman's (1985:xi) advice that "there is little analytic merit in choosing between many of the polarities current in theory and methodology … we need not be either interpretivists or positivists, micro or macro analysts, or even qualitative or quantitative researchers". However, eclecticism does not mean that the study was pursued in a haphazard fashion because attention was paid to the choice and validity of appropriate methods of social inquiry and analysis as clarity on these elements played a major role in the choice of the research design.

5.3 The case study method

The study employed the case study approach to social research. It is important to note that the term "case study" has multiple meanings. It can be used to describe a non-sampling research method in sociological studies which generates non-numeric data from qualitative data sources such as observation, participant observation, group discussions and interviews for qualitative analysis to produce holistic picture of human societies and social structures and processes (Myers, 1997; Tellis, 1997; Stake, 1995; Yin, 1994). In the context of this study it was used to undertake a detailed analysis of the Qamata Irrigation Scheme to explain the dynamics and processes of irrigation technology transfer policy at Qamata. The rationale for the approach is that the knowledge of a social phenomenon can best be acquired from an intensive examination of a single case because some processes and interactions can be studied properly as they operate and interact in a single unit. The proposition is that if one learns how the processes operate and interact in one instance, one can learn about them in the abstract (Myers, 1997).

The case study approach offered the opportunity to conduct the research in great detail and permitted the use of several data sources to generate a variety of data which were subjected to rigorous qualitative and quantitative analyses. From a realist perspective, what makes the case study approach suitable for this study is that it helped in determining the attitudes, perceptions, values and beliefs of the irrigation and dryland farmers surveyed and the interactions among them (Feagin, Orum and Sjoberg 1991:2; NOAA Coastal Services Center and National Marine Protected Area Center, 2005:43). The case study approach thus facilitated the assessment of socio-economic trends and behaviour at Qamata attributable to the establishment of the irrigation scheme and the technology and skills it brought to the area.

The use of case study method of research suggests that the problem which was investigated is a part of a larger set of parallel instances of rural poverty in the former homelands in the Eastern Cape and that many intervention programmes have been embarked upon at different times and in different places to alleviate the problem. The fundamental lessons drawn from the use of the case study approach are summarised below.

1. Social action, phenomena and structures were observed in a natural setting. Therefore the findings are closest to how the irrigation and dryland farmers perceived their actions and circumstances at the time of the

investigation. Feagin *et al* (1991:10) hold the sentiment that the study of total complexes of social action is indispensable in social research because "action and belief are not very meaningful unless observed in the immediate context".

2. A holistic study and analysis of the effects of irrigation technology transfer policy at Qamata were possible because data were solicited from a number of sources and over a period of time.
3. It permitted the incorporation of dimensions of time and history in the study of the socio-economic life at Qamata. The study was completed in the span of five years. This means that changes in social and economic activities and the patterns of life were fully observed and understood.
4. The detailed data generated provided a solid empirical basis to examine the existing concepts and generalisations about the nexus between public policy and the transfer of agricultural technology to the rural people via irrigation schemes. The interpretations of major concepts and notions suggested in this study are the corollary of the case study approach.
5. The case study approach provided insights into agricultural production and management systems at Qamata. The adoption of new techniques of agricultural production as a consequence of the transfer of irrigation technology to the local farmers and its role in poverty alleviation could be investigated in great detail and the inherent weaknesses of the development policy were exposed.

A frequent criticism of case study research is that its reliability is low because much depends on the capacity and personality of the observer (Bulmer, 1983a: 10). However, the methodological framework of the study permitted the use of other complementary methods such as standardized questionnaires and group discussions to overcome this shortcoming.

5.4 Data solicited

The variety of data solicited was the consequence of the aims, objectives and hypotheses of the study (see Sections 1.3 and 1.4 of Chapter 1). The analysis of the effects of the policy of irrigation technology transfer to the people at

Qamata required a combination of social, political and economic data to present a holistic picture of the real rural situation from which the level of development and living conditions of the people and social and political interactions stood discernible (Curwin and Slater, 1996:44). The data was carefully selected to provide meaningful insights into what has been happening to poverty, unemployment and inequality in the distribution of income and assets as a result of the irrigation technology transfer policy. The data was expected to bring considerable insight to bear on the irrigation development policy with regard to the creation of conditions for the realization of human potential in the Qamata area.

The socio-economic indicators selected for the study for which data was solicited via a questionnaire survey were policy formulation, techniques of production and sustainability of rural livelihoods, economic well-being, development of entrepreneurial and managerial skills and social relations. Perceptional data was gathered through interviews and observation and was analyzed qualitatively. Certainly the information framework was wide, reflecting the diverse nature of development policy. Besides, the multivariate character of the data was occasioned by the dictates of the central tenets of critical realism which suggest that social phenomena ought to be investigated from several perspectives to provide adequate information for objective analyses (Trochim, 2002; Warwick, 1983:280).

Data collection is a costly and time-consuming exercise. Effort was made to ensure that only the data relevant to the aims, objectives and hypotheses of the study was collected. However, as it will be noted in Section 6.1.1 of Chapter 6, the approach to the study was continually refined as the study progressed; as a result some of the data solicited became redundant and could not be used. The quality of the data received attention, bearing in mind that bias could lead to misleading findings and inappropriate conclusions.

The longitudinal aspects of the study demanded that data be elicited from previous reports and social surveys by Qamata Irrigation Scheme, research institutions, commissions of enquiry, government departments, NGOs and individual academics. The problem is, following the grant of nominal independence to the former homelands, statistical data was poorly organised and kept by the Bantustan authorities. Tapscott and Thomas (1985:92) attribute the problem to the shortage of skilled and trained personnel in the homelands at the time of 'independence'. The choice of past data and variables for this study was therefore determined by their availability and their relevance to the study. The range and variety of primary data solicited for the study are contained in Appendices 1 to 9. The details of each indicator for which data were elicited are discussed below.

5.4.1 Policy formulation

The data solicited for policy formulation seeks to investigate how the decision to establish the irrigation scheme at Qamata was arrived at. The aim is to establish whether the intended beneficiaries contributed towards the irrigation development policy formulation processes and if the policy to develop the irrigation scheme at Qamata reflected the needs of the local people. The capacity of policy to successfully address issues of public concern depends on the relevance of the policy to the issues at stake. Relevant and appropriate policies might best be made when those who experience and feel the problems are directly involved in the policy-making process. Rondinelli (1993:185), Turner and Hulme (1997:144) and Treurnicht (2000:67-68) reiterate the importance of participatory and adaptive approaches to development policy formulation and development planning as essential strategies towards the realization of development objectives. This study therefore regards policy formulation as a legitimate subject of enquiry. Data was also solicited from the irrigation farmers and extension officers via group discussions to ascertain the involvement of local farmers in the management of the Qamata Irrigation Scheme.

5.4.2 Technical capacity building

This parameter investigates the extent to which agricultural production in the Qamata area has been rendered sustainable as a result of the establishment of the irrigation scheme and the techniques of production that came with it.

The contention is that, if the irrigation development policy intended to transfer irrigation technology to the farming community at Qamata and render the scheme sustainable, then technical capacity building of the beneficiaries should occupy the centre stage of planning and operation. The data solicited on technical capacity building included, *inter alia*, the sources of farming skills of the farmers, facilities for training and extension service availability. With adequate capacity building QIS is expected to generate development impetus to trigger structural transformation of the local economy and create viable employment opportunities besides agriculture, just like the kibbutz in Israel (Fidler, 2002).

The data solicited provided insights into the types and nature of the predominant economic activities in the Qamata. The data provided the basis for assessing whether the scheme is viable and sustainable or it is possible to replicate the irrigation scheme or similar intervention programme elsewhere in the Qamata area.

5.4.3 Social and economic well-being

Social and economic well-being as an indicator investigates whether there has been an improvement in the material life of the farmers participating in the irrigation scheme. Data on incomes, food security, employment and outmigration was solicited from both irrigation and dryland farmers for comparative analysis. The dryland farmers serve as a control situation where different agricultural production techniques and technologies are used. On the scale and techniques of production, the contention is that over forty years of being in operation if the QIS has had any positive impact on the social economy of Qamata, the spread effect should occasion the use of modern techniques of production geared towards the market in the irrigated farms as well as in the dryland farms adjacent to the irrigation scheme. It is expected that the ensuing increase in the agricultural production should exert multiplier effects in the local economy (Little, 1990:11). In addition, data about infrastructure, housing, health and sanitation was elicited to ascertain the state and availability of these essential services in the Qamata area.

5.4.4 Development of entrepreneurial and managerial skills

Entrepreneurial and managerial skills are an important indicator that offers information about the capacity of emerging farmers to take maximum advantage of the availability of irrigation water and the accompanying facilities and services to step up production. Farming is fraught with many risks, ranging from production risks (from the vagaries of weather, pests and diseases) to marketing risks (from availability of market and price fluctuations). In poor societies owing to the lack of entrepreneurial and managerial skills, the magnitude of the risks increases as the scale of production expands and techniques of production become more sophisticated and complex (Ramaswami, Ravi and Chopra, 2003:7-8). Emerging farmers thus require high managerial capability if they are to benefit from intervention projects such as irrigation schemes (Bembridge, 1984:195-196). The data solicited provides information about institutional structures (e.g. training facilities) put in place to impart entrepreneurial and managerial skills to the local farmers, sources and nature of managerial skills and experience, marketing and bookkeeping skills and the ability to organise and manage resources for large-scale agricultural investments and production.

5.4.5 Social relations

This indicator assesses the effects of the irrigation scheme on social relations and organisation in the Qamata area. The data about social relations was collected from both the irrigation and adjacent dryland farming communities. The employment and fortune seekers who went to Qamata carried with them a variety of behaviour and cultures to the area. In addition, changes in the local economy as a result of the irrigation scheme precipitated changes in social relations. For example, a class of wealthy farmers emerged while a landless class of people was created. Such changes have profound effects on social organisation and local politics (Holbrook, 1997:4). The data on crime, people's attitude towards culture, custom and tradition, the role and importance of the tribal authority and participation in local politics, among others, was elicited.

5.5 Population of the study

According to the basic tenets of the methodological framework of this study, the results of this study are intended to apply to the Qamata Irrigation Scheme. The people and organisations associated with the irrigation scheme formed the theoretical population of the study (Curwin and Slater, 1996:44). The target population of the study was therefore constituted by the people living and earning their livelihood from the irrigation scheme and the adjoining dryland farms and villages, traders, extension officers, staff and management of QIS, the traditional local authority, government departments, parastatals, NGOs and local and external agencies involved in the socio-economic transformation of the Qamata area. However, the survey population, the units actually covered by the study was much smaller. The identification of the relevant population of the study was essential because it simplified the task of data collection as only the people who were crucial to the survey were contacted to save resources and time.

The enumeration of the entire accessible population was ruled out for two reasons: firstly, the available financial resources and time were inadequate to permit a meaningful total coverage, and secondly, the study focused on inferences that could be drawn rather than just the number of people and institutions who directly participated in the investigation. The sampling technique was employed to collect data from the target population because the technique ensures representativeness and permits inferences of calculable precision to be drawn. Curwin and Slater (1996:45-51) argue that a sampling coverage permits a higher overall level of accuracy than a total enumeration because a few cases make in-depth survey and detailed analysis possible.

5.5.1 Sample design and sampling frame

A sample survey design was adopted as it assures a high level of accuracy at a minimum cost (Bulmer, 1983b:97). The foundation of the sample design was the random sampling technique which guaranteed that the different elements in the target population had equal calculable and non-zero probability of being drawn into the sample (Trochim, 2002; Curwin and Slater, 1996:44; Bulmer, 1983b:91; Clarke and Cooke, 1978:31). Hence, the problem of systematic bias in the sampling procedure was avoided. The result was that the variability in the population was reflected in the primary sample.

Once the theoretical and target populations had been identified and the sample design chosen, the next task was to draw the samples from which data was elicited. The listing of the target population from which the sample was drawn is called the sampling frame (Trochim, 2002). The study required data from a variety of informants, namely, irrigation farmers, dryland farmers, traditional leaders, business men and women and extension officers, to test the hypotheses. Since each group of informants was different, it was decided that stratified random sampling would be appropriate and a separate sampling frame was prepared for each group. The lists of extension officers and irrigation farmers obtained from QIS provided the frames for drawing respondents from these subgroups of informants. Similarly, the list of chiefs and headmen obtained from the Great Place at Qamata (the seat of the Paramount Chief of Western Thembuland) served as the sample frame for selecting the chiefs and headmen who participated in the exercise. The lists of dryland farmers in the villages adjoining the irrigation scheme provided by the respective chiefs and headmen were used to compose a sampling frame to draw respondents from the dryland farmers' category. With the assistance of the extension officers, a quick census of businesses in the Qamata area was undertaken to compose a sampling frame for selecting the traders who participated in the research.

A simple random sample was taken from each subgroup except the category of extension officers where total enumeration was undertaken owing to their small number (Table 5.1). Stratified random sampling permitted the knowledge about the population to be used to increase the precision of the sample. It assured adequate representation of the subgroups, especially minority groups. It eliminated the probability of choosing the sample from one stratum, or over and under representation of some strata. The proposed sample (Table 5.1) thus bore a great deal of the variations inherent in the target population. Table 5.1 below illustrates the distribution of (both proposed and actual) respondents for the main questionnaire survey.

Table 5.1 Distribution of sample

Stratum	Population (N)	Sample (Proposed)		Sample (Actual)	
		Size (n_P)	Sample fraction (%) (n_P/N)	Size % (n_A)	Sample fraction (%) (n_A/N)
Irrigation farmers	975	98	10,0	76 (n_i)	7,8
Dryland farmers	450	45	10,0	43 (n_d)	9,6
Traditional leaders	39	14	36,0	14 (n_t)	36,0
Traders	98	10	10,2	10 (n_b)	10,2
Extension officers	8	8	100,0	7 (n_e)	87,5
TOTAL	**1570**	**175**	**11,2**	**150**	**9,6**

The selection of respondents from the irrigation and dryland farmers' subgroups needs some detailed explanation. As discussed in Section 4.3.4 of Chapter 4, QIS is divided into six sections which vary in terms of area and number of farmers. In an attempt to reflect the variability of the population of irrigation farmers in the sample and also to avoid a situation where the entire sample was drawn from one or few sections of the scheme, stratified sampling was employed. The distribution of the sample of 76 irrigation farmers (n_i) among the various sections is represented in Table 5.2.

Table 5.2 Distribution of sample of irrigation farmers' subgroup

Sections	Population of irrigation farmers	Sample (Proposed)		Sample (Actual)	
		Size	Fraction (%)	Size	Fraction (%)
1	164	16	10,0	12	7,3
2	141	14	10,0	11	7,8
3	271	27	10,0	21	7,7
4	126	13	10,0	10	7,9
5	191	19	10,0	13	6,8
6	81	9	11,1	9	11,1
TOTAL	**975**	**98**	**10,05**	**76**(n_i)	**7,8**

In the dryland farming community a sample of 43 farmers (n_d) was drawn from a total of 450 farmers unevenly distributed across 9 villages on the fringes of QIS (Table 5.3 and Figure 1.2).

Table 5.3 Distribution of sample of dryland farmers' subgroup

Villages	Population of dryland farmers	Sample (Proposed)		Sample (Actual)	
		Size	Fraction (%)	Size	Fraction (%)
Rwantsana	58	6	10,3	6	10,3
Xabisaweni	46	5	10,9	5	10,9
Luxeni	51	5	9,8	4	7,8
Mkhonjane	43	4	9,3	4	9,3
Tatsi	50	5	10,0	5	10,0
Nduluni	41	4	9,8	4	9,8
Camama	53	5	9,4	5	9,4
Qamata Basin	71	7	9,9	7	10,0
Taleni	37	4	10,8	4	10,8
TOTAL	**450**	**45**	**10,0**	**43** (n_d)	**9,6**

The fact that stratified random sampling design was chosen does not mean that it is free from error as compared to other non-probability designs, such as quota, purposive and heterogeneity sampling. The choice was conditioned by the need to reduce sampling error to the minimum. Notwithstanding the merits of the stratified sampling recounted above, the design involves error which is classified into sampling error (the difference between sample estimate and population parameter) and non-sampling error (inaccurate measurements and distorted sample values) (Trochim, 2002; Bulmer, 1983b:96; Ward, 1983:131; Zarkovich, 1983:102-104). The source of error of this study might probably lie in the pre-existing lists which were used to compose sampling frames for irrigation and dryland farmers and traditional leaders, or the manner in which the research assistants administered the questionnaires.

The data elicited from the staff of QIS, NGOs, government departments and parastatals was not meant for quantitative analysis; the respondents from these categories of informants were selected for communication purposes to either clarify pertinent issues or to solicit additional secondary data. The selection of respondents from these subgroups was based on purposive sampling.

5.5.2 Sample size

The proposed optimum sample size depicted in Table 5.1 was the result of the interplay of several factors, prominent among which were theory, costs, resources available and the desired level of accuracy. The theoretical rules that guide the choice of appropriate size of sample in a social research are many. The most popular of these rules is the $1/10^{th}$ (one-tenth) rule which states that the researcher should select $1/10^{th}$ of the population she or he studies in her or his sample (Black and Champion, 1976:3). It is convenient when the target population is not too large so that a manageable size of sample is generated. Since the populations of the irrigation and dryland farmers and traders were not too large the rule was applied to the selection of samples for the three strata (Table 5.1). However, Curwin and Slater (1996:53) advise that where there are small groups, it is proper to select larger proportions of the groups to ensure that their views are adequately represented. Accordingly, it was proposed that 36% of the traditional leaders be incorporated in the sample, and total enumeration was recommended for the extension officers' stratum since they were in total only thirty-nine and eight respectively.

A total sample size of 175 (n_P) was proposed for the questionnaire survey. The figure was deemed appropriate for an accessible population of 1570 people (N): the overall sample fraction (n_P/N) was expected to be 11,2% which appeared manageable in term of time and the available resources. Owing to logistical problems such as transport on the fringes of QIS, it was thought that increasing the size of the sample might not lead to an increase in the level of accuracy a sample size of 175 would yield because non-sampling error would inevitably increase (Bulmer, 1983b:97; Zarkovich, 1983:102-104).

It is normal that in a voluntary social survey there is some element of non-response (Curwin and Slater, 1996:61). As Table 5.1 shows, the response rate was not 100% for irrigation farmers, dryland farmers and extension officers' strata. The concern with the response rate was linked to the effect of low rates on the representativeness of the sample and the consequent accuracy of the population estimates. The overall non-response rate was 1,3%; the majority of it came mainly from the irrigation farmers subgroup. Within the irrigation farmers' stratum, the non-response rate was 1,2%. Initially I thought that owing to the high incidence of illiteracy among the dryland farmers, the non-response rate in that subgroup would be higher.

The cooperation of the chiefs and headmen of the villages were solicited to persuade the farmers to cooperate, and it appears the effort paid off.

In an attempt to ascertain the impact of the rate of non-response on the accuracy of the study, I had a discussion with a social statistician. I was assured that the response rate of the sample survey was very good and that the magnitude of the non-response rate was too small to have any significant impact on the population estimates (Personal communication, Mr. J. Nasila, Lecturer, Department of Statistics, Walter Sisulu University, Mthatha on 9 April 2005). The efforts made to maximize the response rate at the outset included the assurance of anonymity of respondents and face-to-face administration of the questionnaires. A few of the non-respondents refused to cooperate claiming that it was a sheer waste of time while a majority of them were away for the period of the survey. Unlike quota sampling, random sampling does not permit the selection of other people to replace non-respondents (Curwin and Slater, 1996:62).

5.6 Sources of data

The nature of the study required the use of both existing (secondary) and new (primary) data. Secondary data was the first type of data to be collected. Its use at the commencement of the study did not only provide valuable information for the groundwork to establish the foundation to gain familiarity with the subject matter and study area but also established the context in which primary data was collected and analyzed to test the hypotheses. It was obtained from official statistics supplied by Statistics South Africa, QIS and other government departments and NGOs, newspaper accounts, publications by research institutions and individuals, maps and the internet. Archival materials from the Great Place (the administrative headquarters of the Paramount Chief of Western Thembuland) and the Intsika Yethu Local Municipality provided important sources of information about QIS, the people and the social economy of the area. Oral accounts were checked against information contained in reports, records and books because with the passage of time, people tend to forget and, most often, exaggerate facts and events.

Primary data was the data and other pieces of information specifically collected from the field for the purpose of this study. The sources of the primary data were mainly observation, interviews, group discussions and questionnaire survey. Rather than being in competition, these methods complemented each other.

5.6.1 Observation

Some qualitative data on weather, vegetation, topography, land use, social relations, rural economy, methods of agricultural production and infrastructure services at QIS and the surrounding area were elicited through observation. Regular visits with varying durations were paid to the study area from November 1999 to December 2005 and between May 2007 and April 2008. Indeed the study commenced with observational trips to Qamata area to acquire information which aided the formation of the objectives and hypotheses of the study. As evident in Sections 4.5.1 and 4.5.2 of Chapter 4, my long association with the area afforded me the opportunity to gather firsthand information on social events, economic activities and the state of the irrigated plots through observational methods. A number of farms and villages were randomly selected and visited at different times. In addition, I attended farm demonstrations, meetings of extension officers and irrigation and dryland farmers (with the assistance of interpreters).

In order to reduce observation bias usually influenced by the researchers' perception of processes and events, the aspects of social phenomena observed were studied objectively; such a reflexive stance was of critical importance during the interpretative stage. Strict adherence to the central tenets of the methodological framework, the need to produce knowledge, helped to reduce observation bias. Similar phenomena were selected and observed in similar fashion. Besides, representative sampling of villages and farms in both dryland and irrigation farming communities ensured that a representative sample of each group was observed. All the phenomena observed were systematically recorded. The accuracy of some oral accounts from informants and documentary evidence was assessed through observation. As Fitzpatrick (2003:5) avers, the distinguishing characteristic of the method is that it does not depend on the memory of any informant or participant observer. The method enabled the researcher to gain valuable insight into the perceptions, preferences and values of agents in their natural settings in order to construct the effects of QIS on the transfer of irrigation technology and rural development at Qamata.

Observational research findings are considered strong in validity because the researcher is able to collect a depth of information about both physical and cultural aspects of social life (Adler and Adler, 1994:377). Observing people and activities in natural settings is a key aspect of qualitative research. However, the method is associated with problems of generalizability. Owing to its flexibility, observation cannot be replicated and the findings only reflect a unique population and therefore cannot be generalized to others. The problem of generalizability was reduced via the use of representative samples. Wherever possible, people, activities and processes were observed with the permission of local leaders and the affected groups and individuals. The people did not expect any immediate material benefit from their cooperation. They viewed their participation in the study as a means to showcase their communities as their long term objective is to attract tourists to their communities (Personal communication, Chief S. E. Matanzima at the Great Place on 21 December 2004).

5.6.2 Interviews

Personal interviews were conducted (between July 2004 and October 2005) to collect more qualitative data on the impressions, experiences and perceptions of the stakeholders of QIS. The results of the interviews shed light on the answers to the questionnaires and provided the missing links in the answers. The interviews provided greater depth of understanding than the other methods employed in the study to elicit data. How the respondents felt about the issues in question and the accuracy of their responses were assessed from the consistency of their responses. Originally only ten interviews were planned but as the study progressed participation was expanded to twenty to include a wide range of stakeholders who were not covered in the questionnaire and observation surveys. The informants included former officials of TRACOR, QIS and Department of Agriculture, former politicians, retired headmen and local activists, chiefs, nurses, school teachers and principals, representatives of Qamata Farmers' Association, unemployed people, farmers and retired farmers. The interviews were conducted by the researcher with the help of interpreters (where respondents could not communicate in English language). The process was time-consuming, on the average each interview lasted between one hour and one-and-half hours.

Taking cognizance of the notion that most of the people, especially the farmers, would have been too young to have input into the planning phase of QIS, the purposive sampling technique was adopted specifically to include older people in the sample to shed light on the initial irrigation planning and development policies at Qamata. As Appendix 6 (Interview Schedule) indicates, the interviews were semi-structured with a standardized interview guide. The questions were built around a number of key issues, including policy formulation and implementation and the ability and potential of QIS to initiate and sustain community development through innovation and transfer of technology to the local farming population. Not every question was asked of each participant, but each question asked was presented in the same way to each participant to minimize bias. The aim was to ensure that the questions had the same meanings to the respondents. However the interviewer (i.e. the researcher) was at liberty to vary the sequence of questions. The interviewees were encouraged to reflect and pursue their own interpretations of the impact of QIS from their experience. The approach engaged the interviewees in a deeper exploration of their ascribed meaning of QIS and the social relations and interactions it has given birth to. The structure of the interviews was so flexible that the respondents were motivated to give fairly accurate responses.

5.6.3 Group discussions

Separate groups of extension officers and irrigation and dryland farmers were met to explore further the issues and concerns individuals raised during the interviews and the results of the questionnaire surveys. The group discussions with the extension officers and irrigation farmers took place on the 2 and 5 of September 2005 respectively at QIS at Qamatapoort. The dryland farmers met on the 7 of September 2005 at Qamata Basin for their group discussion. The group discussions were facilitated by the researcher (with the assistance of interpreters) to collect, *inter alia*, in-depth qualitative information about the groups' perceptions and experiences at QIS and the scheme's impact on the development of the local communities. The issues discussed with the various groups are contained in Appendices 7, 8 and 9. It was a quick and efficient way of getting common impressions, viewpoints and comments about the rural intervention programme. Each of the three group discussions lasted for an average of one-and-half hours. Out of the eight extension officers at the scheme, six participated in the group discussion: two were not available at the time of the discussion although they were equally informed and invited. The participants from the irrigation and dryland farmers' categories were randomly selected with the aid of the sample frames from the scheme and the Tribal Authority respectively. Eight irrigation farmers were randomly selected to participate in the group discussion; two of them had earlier participated in the questionnaire survey. None of the five dryland farmers who were randomly selected for the discussion participated in the questionnaire survey. The overall impression was that the participants were frank and friendly and articulated their views eloquently. However attempts to organise a grand discussion forum for the three groups of participants failed to materialize. Apparently it was very difficult to schedule more than eight people to meet together.

5.6.4 Questionnaire survey

The questionnaire survey consisted of five sets of questionnaires (Appendices 1 to 5) administered within the same period by five groups of research assistants. As indicated in Table 5.1, they were designed to solicit data about QIS from extension officers, irrigation and dryland farmers, traditional leaders and business men and women in the Qamata area. The rationale for expanding the data sources was to obtain crucial information that might not be available from only one or two sources.

The questionnaires were compiled to reflect the objectives of the study in order to generate the required quantitative data to statistically test the hypotheses. In an attempt to design coded questionnaires of acceptable quality and standard, the works of several authors were consulted. The works of Curwin and Slater (1996:54-61), Crawford (1997: Chapter 4), Taylor-Powell (1998), Morrison (2000:245-266) and Burgess (2001) were particularly helpful. What made the works of these authors very useful is the fact that there is no theoretical base to guide a social researcher to develop a flawless questionnaire. The do’s and don’ts born out of their studies and experiences guided the researcher to produce the questionnaires used in this study. The design of a questionnaire is certainly a matter of art rather than science (Crawford, 1997: Chapter 4).

The low literacy level in the study area (see Section 6.2.5 of Chapter 6) was given much thought when deciding the content and wording of the questions. The questions were clearly and unambiguously formulated, with the least possible scope for misunderstanding and, therefore, for wrong answers. The questionnaires were thus designed to contain closed-ended questions with multiple choice answers. The multiple answers were derived from the responses to the open-ended questions used in a pilot survey. Wherever possible, the respondents were given the opportunity to enter their own answers under ‘Other, please specify’. This ensured that important answer choices were not left out. Besides, it provided useful information for qualitative analysis. Each question was evaluated on the basis of its contribution towards the achievement of the research objectives. The main merit of the questions was that they sped up interviews which were largely a matter of ticking appropriate answers and occasionally writing short simple factual answers. In addition, the research assistants had little room for mistakes. The questionnaires were specifically designed to elicit data that could be analyzed with the Statistical Program for Social Sciences (SPSS).

5.6.4.1 Pilot survey

Pre-testing is an important part of questionnaire design. The aim is to detect flaws in the questioning and correct them before the commencement of the main survey (Crawford, 1997: Chapter 4; Taylor-Powell, 1998:14; Burgess, 2001:15). Accordingly, a pilot survey was undertaken in the Qamata area between 15 and 29 May 2004. Included in the pilot survey were 20 irrigation farmers, twelve dryland farmers, four extension officers, three traders and three traditional leaders.

The analysis of the pilot survey offered an opportunity to check the suitability and order of questions and gave an indication of the sort of the data that was eventually produced. It also made it possible to estimate the time and other resources needed to administer the main survey. Last but not least, it offered practical training grounds for training the assistants engaged to assist in the administration of the questionnaires. The outcome of the pilot survey was not included in this study because it bore close resemblance (in terms of the distribution and pattern of responses) to the findings of the main survey which will be presented in Chapters 6 and 7.

5.6.4.2 The main survey

Owing to the low rate of literacy in the study area, it was decided that the questionnaires would be administered with the assistance of interviewers: answering the questions required the ability to read and comprehend in English language. In a study in rural Transkei in 1995, it was found out that as much as 21,5% of the respondents had never had formal education, and the level of education of 51,0% ranged between standards 1 and 6 (Kodua-Agyekum, 1997:87). Consequently less than 25% of the total number of questionnaires was handled by me because I could not communicate effectively in Xhosa, the local vernacular. My participation was thus limited to the availability of a reliable interpreter and to a few of the respondents who could communicate in English. I mostly supervised and observed the interview process.

Ten extension officers (six from the Scheme and four from the district office at Cofimvaba) and two local school teachers who were familiar with the area were engaged to assist in the administration of the questionnaires as interviewers. They were briefed on the objectives and scope of the study and were given two-day training at QIS where the entire questions contained in the questionnaires were read, explained and discussed. The training workshop was facilitated by the researcher. After months of preparation and anxiety, the main survey commenced on 1 July 2004 and lasted for a period of approximately four weeks to 31 July 2004. The use of local personnel, especially extension officers, as translators and research assistants was helpful because they are familiar with the farmers and could easily establish rapport with the respondents.

Throughout the exercise, the respondents enquired if the outcome of the survey could lead to the creation of jobs and infrastructure in the area. Fortunately, the introductory letter of the questionnaires which clearly stated the objectives of the survey offered adequate and satisfactory response to such probes. Just before the start of the survey, the Qamata Traditional Authority urged the people in the area to cooperate; probably the willingness of the people to participate freely and openly might be attributed to this factor. At the end of each day, the completed questionnaires were scrutinized and corrections were made wherever it was necessary when memory was fresh. On completion of the main survey the involvement of the interviewers in the study ceased.

5.7 Data analysis

Both qualitative and quantitative methods of data analysis were used to analyze the multiple sets of data gathered at different stages of the research in order to test the contentions and hypotheses of the study. These methods of data analysis were used in a complementary fashion to facilitate the understanding of the effects of public policy on irrigation technology transfer and community development at Qamata. The quantitative techniques helped to bring out complex relationships inherent in data while the qualitative techniques sought to explain the relationships to render them meaningful.

The data obtained through observation, group discussions and interviews were analyzed qualitatively. The analysis involved the use of Microsoft Excel to work out simple percentages to show the distribution of the variables to aid comparisons. The coded responses were entered into a computer with the

2003 student version of SPSS computer packaged program. The data was analyzed in the following stages:

1. tabulation of the variables was made to facilitate easy understanding of the general distribution of the data.
2. cross tabulations were made to determine associations between variables.

Moderate statistical analyses, namely, chi square test and independent samples t test were performed on the data respectively to statistically test hypotheses of association and significance of the difference between the means of different factors. The outcomes of the analyses of the data will be presented in Chapters 6 and 7. In order to make forthright and compelling decisions, carefully selected aspects of the research findings were analyzed statistically to test the contentions of the hypotheses of the study. *Statistical Decision Theory* was employed to analyze and choose between two competing views represented by each hypothesis on the basis of the data obtained through random sampling (Arsham, 2005:1; Curwin and Slater, 1996:257-265). It was a data-driven quantitative analytical exercise which helped the study to secure more information from the data obtained from the questionnaire survey.

5.7.1 Chi square test

The chi square test was selected because it is a non-parametric test. A non-parametric test is used when it is not possible to define meaningful parameters for a population. For instance, it is impossible to determine the average food security of households or health of farmers in numerical terms. It should be noted that when a test result is significant in statistical terms, it may not have any pragmatic relevance. It is therefore necessary to complement statistical analysis with qualitative analysis. The tests of hypotheses set out to investigate associations between carefully selected variables and indicators of welfare. Two competing hypotheses are initially constructed for each pair of variable and welfare indicator:

H_o: There is no association between the variable and indicator

H_1: There exists some association between the variable and indicator.

With the assistance of SPSS, the chi square non-parametric test was employed to respond to the null assumptions. The *p-value* which gives an indication of the degree of association between each pair of variable and indicator is obtained by the following formula:

$$x^2 = \Sigma \frac{(O - E)^2}{E}$$

where,
O = the frequencies observed;
E = the frequencies expected; and,
Σ = the 'sum of' (Geography Exchange, 1999:1).

If an association exists between a variable and an indicator, then variability of one can be accounted for by variability of the other. A statistical decision is made by comparing the p-value to a level of significance. Usually and in this analysis, the significance level of 0.05 is selected. The null hypothesis is rejected when the p-value is smaller than the significant level of 0.05.

5.7.2 Independent samples t-test

The independent samples t-test was employed to explore the influence of irrigation technology on rural and agricultural development at Qamata by comparing the techniques of production under irrigation and dryland farming and the levels of welfare the two independent groups of farmers experience. The exercise was intended to shed more light on the performance of QIS in order to facilitate forthright and compelling conclusions. The independent samples t-test was successfully employed in a similar circumstance by Vermillion, Samad, Pusposutardjo, Arif and Rochdyanto (2000) to assess small-scale irrigation management turnover programme in Indonesia.

The independent samples t-test is used for verifying whether the means of two groups statistically differ from each other. It is particularly suitable when comparing two independent groups (e.g. irrigation and dryland farmers) where the samples differ in size. Besides being easy to apply and understand, it is easily adapted to a wide spectrum of situations. It is thus the most widely used statistical test of all time (Lowry, 1999: Chapter 11). Its utility in this study was occasioned by the fact that the study seeks to examine the influence of irrigation technology on rural and agricultural development, with dryland farming serving as the control experiment. Irrigation and dryland farmers were considered to be independent because a member of one group could not possibly be in the other group.

The independent samples t-test commences with the formulation of the null hypothesis. In general, the null hypothesis is the logical antithesis of the supposition under examination. What this means in the case of this study is that any difference between the means of the samples drawn from the irrigation farmers and dryland farmers should not differ significantly from zero. The two competing hypotheses are stated as follows:

H_o: $\mu_i = \mu_d$

H_1: $\mu_i \neq \mu_d$

where,

μ_i is the mean for irrigation farmers, and

μ_d is the mean for dryland farmers.

The formula for the independent samples t-test (t-statistic) is:

$$t = \frac{(x_i - x_d) - (\mu_i - \mu_d)}{\sqrt{\left(\frac{ss_i + ss_d}{n_i + n_d - 2}\right)\left(\frac{1}{n_i} + \frac{1}{n_d}\right)}}$$

where,

x_i is the sample mean of the irrigation farmers,

x_d is the sample mean of the dryland farmers,

μ_i is the population mean for irrigation farmers,

μ_d is the population mean for dryland farmers,

ss_i is the sum of squares for irrigation farmers,

ss_d is the sum of squares for dryland farmers,

n_i is the size of the sample of irrigation farmers,

n_d is the size of the sample of dryland farmers, and

$n_i + n_d - 2$ is the degrees of freedom (df) for the independent t statistic (Freund, 1992:404).

As a matter of procedure, the level of significance, called alpha (α) is set in advance. Usually and in this analysis, the level of significance is set at

$\alpha = .05$. Having calculated the t-statistic, the resultant p-value is compared with α (i.e. .05) and the interpretation and conclusion are as follows:

- if the p-value is greater than the level of significance (.05), the null hypothesis is accepted;
- if the p-value is less than the level of significance (.05), the null hypothesis is rejected;
- if the confidence interval does not contain zero, the null hypothesis is rejected; and
- if the confidence interval contains zero, the null hypothesis is accepted.

5.8 Summary

Different methods and approaches have been used to investigate the effects of the Qamata Irrigation Scheme as a rural development intervention strategy to empower the people at Qamata to emancipate themselves from the clutches of poverty, deprivation food insecurity and unemployment. The eclectic nature of the study necessitated the use of a wider methodological framework to generate qualitative and quantitative data. The approach was specifically not rooted in any particular epistemic perspective, although careful appreciation of the methodological framework shows an inclination towards post positivist critical realism. The rationale for the eclectic approach is to provide a holistic picture of the development process at Qamata by drawing on the relative strengths of the different epistemic perspectives. Moderate statistical techniques were used to analyze the quantitative data to bring complex relations and associations to the fore while simple qualitative techniques added sentimental values to the entire data to render them intelligible.

The next chapter discusses the first part of the research findings and provides insights into the social economy of Qamata. The socio-economic factors which reflect the performance of Qamata Irrigation Scheme as a rural and agricultural development project are presented and analyzed. In addition the relationships and patterns of association between the factors are interpreted.

CHAPTER 6

THE SOCIAL ECONOMY OF QAMATA

6.1 Introduction

The outcome of the research is presented and analyzed in Chapters 6 and 7. The aim is to establish the extent to which the Qamata Irrigation Scheme has influenced livelihood options and strategies in the Qamata area in order to set forth the context for the analysis of the effects of the irrigation development and management policies at Qamata which is presented in Chapter 8. Chapter 6 provides insights into the social economy of Qamata. (The description of the physical environment of the study area and its influence on agricultural development are offered in Section 1.5.1 of Chapter 1.) This chapter therefore deals with socio-economic variables such as demographic characteristics of the farmers, basic needs and livelihoods practices. Chapter 7 offers insights into farm practices including farm management to assess the impact of irrigation technology on agricultural production at Qamata. In the meantime, the subsections that follow clarify some aspects of the data used in the analyses.

6.1.1 Use of the data solicited

As already indicated in Section 5.4 of Chapter 5, not all the responses to the questions and issues contained in the interview schedule, questionnaires and the guides to the focus group discussions are presented in the report. Some of the questions and issues served as checks to assess the validity of the responses to the key questions and issues used for the analyses presented in this study. Besides, as the approach of the study was continually refined after the design and administration of the questionnaires, interview schedule and the guide to the focus group discussions, some of the questions and issues they contained became outdated and redundant and could thus not be used in the analyses.

6.1.2 Monthly incomes and annual turnover of agricultural activities

Owing to the multiple income sources of both irrigation and dryland farmers at Qamata (see Section 6.3 of this chapter) it was not possible to use monthly incomes to analyse the performance of farming (in terms of access to cash). Monthly incomes did not reflect the actual incomes that emanated from farming. In this study the variable among the data solicited that gave an approximation of total production was the annual turnover of all farming activities (hereafter referred to as annual turnover). Annual turnover was thus used in the analyses to represent total farm production (output). However, it represented just what was sold as a substantial portion of farm produce was consumed by the households. The assumption was that the portion of farm produce available for sale depended on the total production. Annual turnover in this context reflects the farmers' access to cash and not the net returns from farming. As Van Averbeke *et al* (1998:58) and Holbrook (1992:128) have noted in the Eastern Cape, it is difficult to collect accurate data concerning yields, incomes and financial profits and losses from subsistence farmers.

6.1.3 Food security

As discussed in Section 4.3 of Chapter 4, one of the prime reasons for the establishment of QIS contained in the Plan Report Volume 1 (Xhosa Development Corporation, 1967:97) and the Qamata Development Plan (TRACOR, 1988:1) was to ensure food security of the farmers and their households at Qamata. Since the farmers and their households consume a substantial portion of the farm produce, the main source of food supply of the farmers' households was used in the analyses as an indication of food security. The assumption was that the households whose farming operations constituted the main source of their food supply were self-sufficient in satisfying their food requirements and that only successful farmers could supply the bulk of their food needs to attain food security.

From the above definitions, the level of welfare a farmer experiences was assessed, *inter alia*, in terms of access to cash to purchase the needs which could not be satisfied by the direct consumption of farm produce and in terms of food security. The other welfare indicators used in the analyses are conditions of health, type of housing, education, unemployment and out migration of people (see Section 7.10 of Chapter 7).

6.2 Human background

This section puts the characteristics and quality of the population of Qamata area under the spotlight. Personal and socio-psychological characteristics of a group of people determine the extent to which new ideas, skills and technology are adopted, adapted and applied, and how the change from traditional to modern methods of agricultural production is embraced in the society (Echevarria, 1998:65; Kuhnen, 1982:16-17). The needs, values and aspirations of rural farming communities are mostly determined by the characteristics and quality of the population.

Agricultural and rural development through the transfer of irrigation technology is a dynamic process which involves the use of both human and physical resources. Of the essential factors of production required for rural and agricultural transformation, namely, land, capital and labour, only land is purely physical and the rest are either directly or indirectly related to human qualities and characteristics (Echevarria, 1998:65). Besides, technology, skills, knowledge, entrepreneurship and infrastructure are important supportive systems and structures that provide impetus for agriculture and rural development; these resources are created by the human race (Kuhnen, 1982:16-17). The effectiveness with which land is used is a function of human qualities and characteristics (e.g. ingenuity, ignorance, etc.). The human element is therefore a key factor in the transfer of irrigation technology to the rural people as it plays an important role in determining the level and type of development that takes place in a community (Kodua-Agyekum, 1997:109). Hence it constitutes a legitimate subject of enquiry in this study.

6.2.1 Gender of respondents (farmers)

Although males dominated both irrigation and dryland farming (56,6% and 55,8% respectively), female participation in agriculture in Qamata area was substantial (Table 6.1). As much as 44,2% of dryland farmers was constituted by adult females; the proportion of female participants in irrigation farming (43,4%) was equally high. Owing to the uncertain and risky nature of dryland farming as a result of inadequate rainfall, most adult males in the villages surrounding the irrigation scheme have migrated to urban centres in the sub-region especially Queenstown and the mining, commercial and industrial centres of the country to look for employment with stable remuneration[35].

Table 6.1 Distribution of farmers and household heads according to gender

Category of farmers	**Gender**	**Farmers (%)**	**Household heads (%)**
Irrigation	Males	56,6	64,5
	Females	43,4	35,5
	Total (n_i=76)	**100,0**	**100,0**
Dryland	Males	55,8	53,7
	Females	44,2	46,3
	Total (n_d=43)	**100,0**	**100,0**

The dryland farmers at Qamata are of the view that the proportion of male dryland farmers (55,8% as revealed in Table 6.1) has increased considerably in recent years because of retrenchments in the mining and industrial sectors and the difficulty with which the poorly educated rural people secure employment in the urban centres[36]. The opinion of these farmers is given credence by Bembridge's (1984:125) survey which indicates that an astonishing 71,9% of the households in Qamata area was effectively headed by adult females who were the prime decision-makers in agriculture in the early 1980s. As already discussed in Chapter 3, the pivotal role of women in food crop production is attributed to the colonial and apartheid policies that instituted and maintained the migrant labour system which reduced the number of young and energetic males in the black rural areas and eventually undermined rural and agricultural development in the former homelands of South Africa.

Informants from Qamata and former officials of QIS and the defunct TRACOR which managed the scheme from 1986 until its disbandment after 1994

[35] The researcher obtained this information at group discussions with irrigation farmers at QIS on 5 September 2005 (Appendix 8, item 18) and dryland farmers at Qamata Basin on 7 September 2005 (Appendix 9, item 17).

[36] The researcher obtained this information at a group discussion with dryland farmers at Qamata Basin on 7 September 2005 (Appendix 9, item 17).

attributed male domination of irrigation farming at QIS to the manner in which plots were allocated; the allocation was grounded in the belief and the culture of male dominance of traditional African society[37]. Southall (1983:227) shares similar sentiments. Consequently, over 90% of the irrigation plots were allocated to males (Personal communication, Chief S. E. Matanzima on 31 May 2005 at the Great Place, Qamata). The traditional African culture denied women legal title to land (Greenberg, 2003a:14). Traditional values were strictly adhered to because, as indicated in Section 3.7.1 of Chapter 3, the then Chief Minister of the former territory of the Transkei, Chief K. D. Matanzima, was the Paramount Chief of Western Thembuland, the seat of which is at Qamata Basin (called 'The Great Place'). The Qamata area was thus in the firm grip of tribal authority and was exposed to the full impact of tribal laws of administration and governance.

The high proportion of adult females in irrigation farming is the result of public policy under the current political dispensation inducing changes in attitude towards women which allow women to acquire and hold land or inherit the plots of their deceased husbands (Festus, 2003:174-175). This observation is premised on the fact that 45,5% of the female irrigation farmers surveyed are widows (Table 6.2). The high proportion of women in farming as a whole at Qamata has an implication for agricultural and rural development.

Table 6.2 Distribution of farmers according to gender and marital status

Category of farmers	Gender	Marital status				TOTAL (%)
		Single (%)	Married (%)	Widow/ Widower (%)	Divorced (%)	
Irrigation	Males	11,6	74,4	11,6	2,4	56,6
	Females	3,0	51,5	45,5	0,0	43,4
	TOTAL (n_i=76)	**7,9**	**64,5**	**26,3**	**1,3**	**100**
Dryland	Males	4,2	91,6	4,2	0,0	55,8
	Females	10,5	84,2	5,3	0,0	44,2
	TOTAL (n_d=43)	**7,0**	**88,4**	**4,6**	**0,0**	**100**

[37] The researcher obtained this information from separate interviews with Mr. N. Mdingi and Mr. M. Hlazo (retired QIS farmers) at St. Marks on 3 September 2005 and Mr. M. G. Daweti (former Project Manager of QIS) and Mr. M. B. Foloti (former TRACOR official at QIS) in Queenstown on 16 September 2005 (Appendix 6, item 6).

The household maintenance chores of women reduce the length of time they spend on the farms. Besides, with the advent of HIV/AIDS, terminally ill relatives return to the rural areas to be cared for by the adult females who are already overburdened by the requirements of the old and young household members (Van Averbeke *et al*, 1998:32-33). There is therefore enormous pressure on the time and resources of female farmers and their participation in farming is seriously hampered. This gives an indication that the area experiences a shortage of farm labour. As will be discussed in Section 7.2 of Chapter 7, the effect is that agriculture is mainly of subsistence nature, producing food for household consumption and exchange and sale of farm produce are limited to occasional surpluses. The consequence of subsistence farming is the widespread nature of rural poverty (see Section 1.1 of Chapter 1).

Table 6.3 shows that a greater proportion of female farmers are engaged in subsistence farming in both dryland and irrigation farming than male farmers.

Table 6.3 Distribution of farmers according to gender and scale of operation

Category of farmers	**Gender**	**Scale of farm operation**		**TOTAL (%)**
		Subsistence (%)	**Commercial (%)**	
Irrigation	Males	90,7	9,3	56,6
	Females	93,9	6,1	43,4
	TOTAL (n_i=76)	**92,1**	**7,9**	**100**
Dryland	Males	91,7	8,3	55,8
	Females	89,5	10,5	44,2
	TOTAL (n_d=43)	**90,7**	**9,3**	**100**

From the cross-tabulation of annual turnover of all farming activities and the gender structure of respondents presented in Table 6.4, it is evident that none of the female irrigation and female dryland farmers' annual turnovers exceeds R14 999,00 while those of some of their male counterparts (though significantly few) in both categories exceed R30 000,00. What this observation implies is that the female farmers' share of annual turnover of agricultural activities is smaller than that of the male farmers because the distribution of annual turnover is skewed in favour of the male farmers.

Table 6.4 Cross-tabulation: annual turnover of all agricultural activities and gender structure of respondents (farmers)

Category of farmers	Gender	Total annual turnover of all agricultural activities							TOTAL (%)
		R0 - R5000 (%)	R5000 - R9999 (%)	R10000 - R14999 (%)	R15000 - R19999 (%)	R20000 - R24999 (%)	R25000 - R29999 (%)	R30000+ (%)	
Irrigation	Males	44,2	25,6	16,4	2,3	4,6	2,3	4,6	**56,6**
	Females	42,4	33,3	24,3	0,0	0,0	0,0	0,0	**43,4**
	TOTAL (n_i=76)	**43,5**	**28,5**	**20,2**	**1,3**	**2,6**	**1,3**	**2,6**	**100,0**
Dryland	Males		12,5	16,7	8,3	4,5	4,5	4,5	**55,8**
	Females	47,4	42,1	10,5	0,0	0,0	0,0	0,0	**44,2**
	TOTAL (n_d=43)	**48,8**	**25,6**	**14,0**	**4,7**	**2,3**	**2,3**	**2,3**	**100,0**

The cross-tabulation of monthly income and gender structures of both categories of farmers represented in Table 6.5 indicates that there is a marked inequality in the distribution of monthly incomes in favour of the male farmers. None of the female irrigation farmers earns more than R3 500,00 per month but 14,0% of the male irrigation farmers earn over R3501,00 per month. In the case of the dryland farmers, while 4,2% and 12,5% of the males earn less than R500,00 and more than R3501,00 per month respectively, 42,1% of the females earn less than R500,00 per month and 5,3% of them earn more than R3 501,00 per month. Inequality in the distribution of rural incomes exists at Qamata.

Table 6.5 Cross-tabulation: monthly income and gender structures of respondents (farmers)

Category of farmers	Gender	Monthly income							TOTAL (%)
		Below R500 (%)	R501 - R1000 (%)	R1001 - R1500 (%)	R1501 - R2000 (%)	R2001 - R2500 (%)	R3001 - R3500 (%)	R3501+ (%)	
Irrigation	Males	41,9	23,3	14,0	4,7	0,0	2,3	14,0	**56,6**
	Females	42,4	48,5	6,1	0,0	3,0	0,0	0,0	**43,4**
	TOTAL (n_i=76)	**42,1**	**34,2**	**10,5**	**2,6**	**1,3**	**1,3**	**7,9**	**100**
Dryland	Males	4,2	75,0	4,2	0,0	4,2	0,0	12,5	**55,8**
	Females	42,1	47,4	0,0	5,3	0,0	0,0	5,3	**44,2**
	TOTAL (n_d=43)	**20,9**	**62,8**	**2,3**	**2,3**	**2,3**	**0.0**	**9,3**	**100**

The p-values of the tests of association between gender structure and annual agricultural turnover are 0.360 and 0.267 for irrigation and dry land farmers respectively (Table 6.6). Since the p-values exceed the level of significance (0.05), the null hypotheses are accepted: no association exists between the variables in each case (see Section 5.7.1). The tests results denote that there is no causal relationship between the gender structure and annual turnover at Qamata. What this means is that increasing the number male farmers is not likely to improve the annual turnover. However improvement in the access of both male and female farmers to institutional services such as training, subsidized inputs, extension service and credit and marketing facilities is likely to impact positively on farm output and hence turnover (see Sections 2.9.1 and 2.9.2 of Chapter 2).

Table 6.6 Summary of tests of hypothesis to assess the association between gender structure of farmers and annual turnover of all agricultural activities at Qamata

Farming category	**Variables**	**p-value**	**Decision**
Irrigation	Gender structure Annual turnover all agricultural activities	0.360	Accept
Dryland	Gender structure Annual turnover all agricultural activities	0.267	Accept

The skewness in the distribution of monthly incomes and annual turnover in favour of male farmers suggests that female farmers' access to cash is restricted; hence they are more likely to bear the brunt of rural poverty.

6.2.2 Age of respondents (farmers)

The age structure of the farmers surveyed at Qamata depicted in Figure 6.1 below is typical of farming communities in the Eastern Cape. The age structure does not differ significantly from those reported by Van Averbeke *et al* (1998:114) in the former Ciskei and Bembridge (1984:130-131) in the former Transkei. The age distribution in each case is skewed towards the older age groups. Over 50% of the respondents in each of the cases were in the age groups ranging from 50 years upwards. In the case of this study, 71,1% of irrigation farmers and 76,8% of dryland farmers surveyed were in the age groups of 50 years and above.

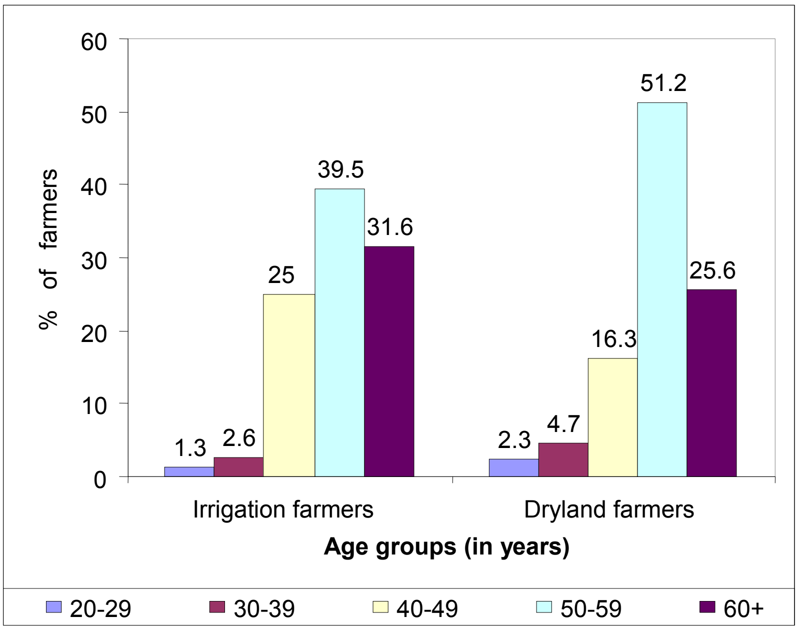

Figure 6.1 Age structure of respondents (farmers)

It should however be noted that one's capacity to perform tasks which require physical exertion and to adopt new farming techniques and ideas of production is inversely related to the number of years one has lived (Farm Safety Association, 2002:1). It is a reality of life that one loses both physical and mental vitality with age. Because farming is a rigorous and strenuous activity which involves a great deal of physical drain, chronological age negatively affects agricultural development in the Qamata area. Considering the proportion of farmers who lack physical vitality, the pressure on the time of female farmers and the streaming of the youth to urban centres, it is a truism that Qamata area experiences a shortage of farm labour.

The following observation from the survey data suggests that chronological age of the farmers limits agricultural productivity, access to information and the adoption of new ideas at Qamata.

(i) The cross-tabulation of the age structure of the farmers and the scale of farm operation (Table 6.7) indicates that an overwhelming majority of the farmers aged over 50 years are engaged in subsistence farming: 95,9% of the irrigation farmers and all the dryland farmers in this subset who participated in the questionnaire survey are subsistence farmers. The information contained in Table 6.7 shows that the age of the farmers at Qamata places limitation on agricultural production. Bembridge (2000:15) argues that besides lacking the physical strength, the farmers in this age group (over 50 years) do not have the incentive and motivation to increase income and living standards, and are largely dependent on income from pensions.

Table 6.7 Cross-tabulations: age structure of farmers, scale of operation and membership of agricultural cooperative societies

Category of farmers	**Age group**	**Scale of operation**		**Do you belong to any agricultural cooperative society?**		**TOTAL (%)**
		Subsistence (%)	**Commercial (%)**	**YES (%)**	**NO (%)**	
Irrigation	20-29	0,0	100,0	0,0	100,0	**1,3**
	30-39	0,0	100,0	50,0	50,0	**2,6**
	40-49	89,5	10,5	21,1	78,9	**25,0**
	50-59	96,7	3,3	20,0	80,0	**39,5**
	60+	100,0	0,0	4,2	95,8	**31,6**
	TOTAL (n_i=76)	**92,1**	**7,9**	**15,8**	**84,2**	**100**
Dryland	20-29	0,0	100,0	100,0	0,0	**2,3**
	30-39	50,0	50,0	100,0	0,0	**4,7**
	40-49	71,4	28,6	14,3	85,7	**16,3**
	50-59	100,0	0,0	4,5	95,5	**51,2**
	60+	100,0	0,0	9,1	90,9	**25,6**
	TOTAL (n_d=43)	**90,7**	**9,3**	**14,0**	**86,0**	**100**

(ii) As much as 71,1% and 76,8% of the irrigation and dryland farmers respectively are aged over 50 years (Table 6.7). The majority of the farmers (87,0% of the irrigation farmers and as much as 96,9% of their dryland counterparts) who are over 50 years of age do not belong to any agricultural cooperative society. Farmer organizations are important for solving problems which cannot be easily solved by individual farmers, especially institutional matters such as pricing, marketing and infrastructure policy issues (Van Averbeke *et al*, 1998:27). The implication is that the majority of the farmers at Qamata do not participate in policy and decision making processes. Besides, information about innovations and developments in the agricultural industry that is disseminated to farmers through farmers' cooperative organisations eludes the farmers; this reduces the possibility and rate of adoption of new technologies and innovations.

(iii) Only 3,7%[38] and none[39] of the irrigation and dryland farmers aged over 50 years respectively operate bank accounts and 7,4%[40] and 10,5%[41] respectively take credits (loans) from a variety of sources to run their farm operations. Under such circumstances, capital formation is extremely difficult and the farmers could rarely adopt new techniques of farming, especially where such techniques require initial capital outlay. It is therefore not surprising that both types of farmers in Qamata area use basic and mostly inadequate farming techniques and implements (see Sections 4.5.1 of Chapter 4 and 7.3 of Chapter 7).

What makes the issue of age pertinent in the area is the fact that the greater majority (73,1%) of the farmers surveyed are over 50 years old. Can they effectively pioneer and sustain development in the agricultural industry and socio-economic development of the entire community in the face of their essential characteristics?

No data was directly solicited to assess the mental vitality of the farmers (respondents). At separate group discussions with irrigation and dryland farmers, the participants vehemently opposed the suggestion that the age of farmers in the Qamata area negatively affects their managerial ability[42]. They rather associate experience and wisdom which could be necessary to step up production with old age. However the notion that old age promotes the experience and wisdom essential for agricultural and rural development is contentious and needs to be investigated.

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[38] The figure was obtained from the cross-tabulation of items 1 and 95 of Appendix 1.
[39] The figure was obtained from the cross-tabulation of items 1 and 93 of Appendix 2.
[40] The figure was obtained from the cross-tabulation of items 1 and 97 of Appendix 1.
[41] The figure was obtained from the cross-tabulation of items 1 and 95 of Appendix 2.
[42] The researcher obtained this information at group discussions with irrigation farmers at QIS on 5 September 2005 (Appendix 8, item 1) and dryland farmers at Qamata Basin on 7 September 2005 (Appendix 9, item 1).

6.2.3 Marital status

The marital status of the farmers surveyed is presented in Figure 6.2 below. The proportion of irrigation farmers who are either single, widowed or divorced is quite high (35,5%) and in the case of dryland farmers, it is relatively lower (11,7%). Marriage is seen as an important and sacred institution by the dryland farmers. This is evident by the fact that 88,4% of the dryland farmers who participated in the survey are married and none of them is divorced. The high proportion of unmarried individuals among the irrigation farmers does not augur well for agricultural and rural development because it limits farming efficiency as both labour and earning capacity of the affected farmers are reduced. The cross-tabulation of marital status and monthly income shows

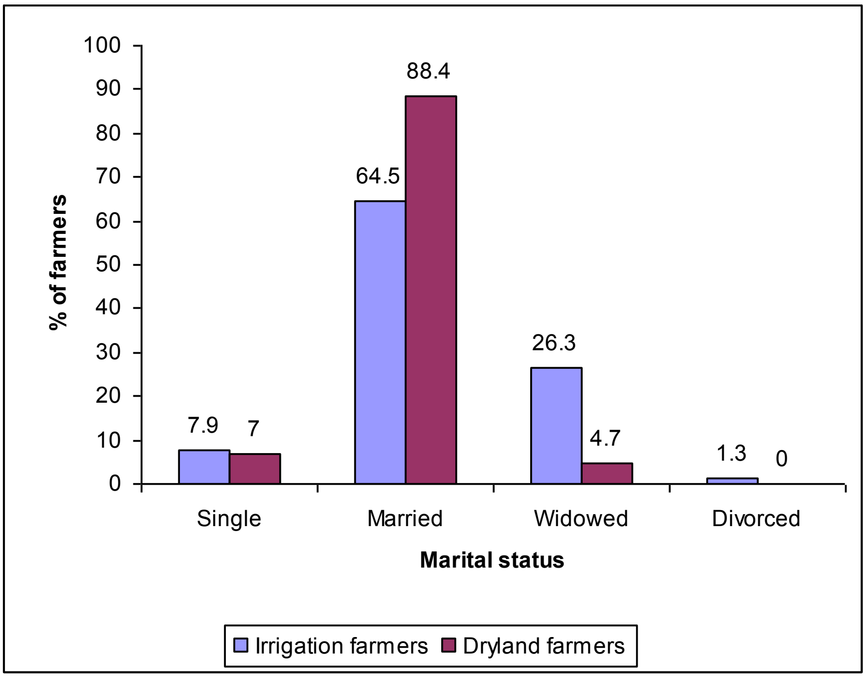

Figure 6.2 Marital status of respondents (farmers)

that incomes of all irrigation and dryland farmers who are single do not exceed R1000,00 per month whereas 6,6% of the irrigation farmers and 9,3% of the dryland farmers with spouses are in the topmost income bracket (Table 6.8). The widowed irrigation farmers' monthly incomes are higher than those of the irrigation farmers who have divorced their spouses; the widowed might have inherited assets which could fetch high returns. The widowed dryland farmers performed poorly in terms of monthly income probably they inherited few low-value assets, bearing in mind the low returns on investments in dryland farming.

The revelations of Table 6.8 are confirmed by Grinstein-Weiss, Zhan and Sherraden (2004:2) who argue that “Marriage has a large effect on reducing the risk of poverty”. In a social survey they observed that unmarried low income participants saved less than married low income participants. Their findings are reinforced by the studies of White and Rogers (2000), Wilmoth and Koso (2002) and Hirschl, Altobelli and Rank (2003) which indicate that non-marriage accounts for limited accumulation of assets and high poverty rates within single parent families.

Table 6.8 Cross-tabulation: marital status and income structure of respondents (farmers)

Category of farmers	**Marital status**	**Monthly income**							**TOTAL (%)**
		Below R500 (%)	**R501 - R1000 (%)**	**R1001 - R1500 (%)**	**R1501 - R2000 (%)**	**R2001 - R2500 (%)**	**R3001 - R3500 (%)**	**R3501+ (%)**	
Irrigation	Single	66,7	33,3	0,0	0,0	0,0	0,0	0,0	**7,9**
	Married	38,8	36,7	8,2	4,1	0,0	2,0	10,2	**64,5**
	Widowed	30,0	30,0	15,0	0,0	5,0	0,0	20,0	**26,3**
	Divorced	100,0	0,0	0,0	0,0	0,0	0,0	0,0	**1,3**
	TOTAL (n_i=76)	**42,1**	**34,2**	**10,5**	**2,6**	**1,3**	**1,3**	**7,9**	**100**
Dryland	Single	33,3	66,7	0,0	0,0	0,0	0,0	0,0	**7,0**
	Married	15,8	65,8	2,6	2,6	2,6	0,0	10,5	**88,4**
	Widowed	100,0	0,0	0,0	0,0	0,0	0,0	0,0	**4,6**
	TOTAL (n_d=43)	**20,9**	**60,5**	**2,3**	**2,3**	**2,3**	**0,0**	**9,3**	**100**

6.2.4 Size and composition of households

The mean size of the households of irrigation farmers is 5,3 persons and that of dryland farmers is 4,1 persons. However, Figure 6.3 shows that 31,6% and 41,9% of irrigation and dryland farmers’ households respectively accommodate more than six people. The figures are similar to those recorded for corresponding groups in the former territory of Ciskei (Van Averbeke *et al*, 1998:113-114) but far less than those recorded in Northern Province in the Arabie-Olifants River Valley (Mphahlele, Malakalaka and Hedden-Dunkhorst, 2000:8).

Table 6,9 shows the composition of children in the households surveyed in the Qamata area. The numbers of children in the individual households of both irrigation and dryland farmers are high. Children in this context are defined as the young people aged eighteen years or less and/or are attending school.

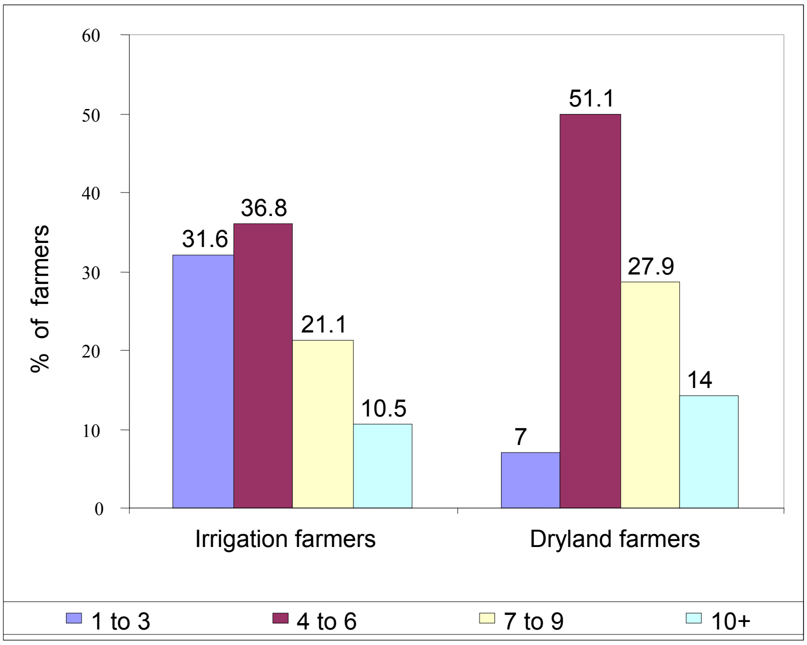

Figure 6.3 Size of households of farmers

The high concentration of children implies that adult's earnings, social grants and remittances are expended on the requirements of young people (e.g. food, clothing, education and health). Besides, the need to care for them prevents most of the adult females from working on a full-time basis on their farm holdings.

Table 6.9 Number of children in the households of farmers

Number of children	**Households**	
	Irrigation (%)	**Dryland (%)**
0	7,9	4,7
1-3	48,7	81,4
4-6	34,2	11,6
7+	9,2	2,3
TOTAL	**100** (n_i=76)	**100** (n_d=43)

Out migration of people has an impact on the composition of the households at Qamata. As indicated in Table 6.10, each of the households surveyed at Qamata has at least one member working outside the local municipal area. The effect is that 46,3% of the dryland farmers' households are headed by females and 35,5% of the irrigation farmers' households are headed by females (Table 6.1); in the case of the latter, the high incidence of widowhood is also a contributory factor (Figure 6.2). The female headed households are the 'granny households', where the female household heads are the grandmothers rather than the mothers of the children in their care (Aliber, 2001:29). The impression one gets from the above analysis is that the number of able-bodied people (aged between 19 and 49 years) is likely to be small at Qamata.

Table 6.10 Number of household members working outside the district

Number of people working outside the district	**Households**	
	Irrigation (%)	**Dryland (%)**
1	46,1	43,9
2	36,8	36,1
3	17,1	13,0
4	0,0	2,3
5+	0,0	4,7
TOTAL	**100** (n_i=76)	**100** (n_d=43)

The essential characteristics of the households at Qamata discussed above militate against development for the following reasons:

(i) there is little or no savings locally for investment in human capital and socio-economic development because of the high dependency ratio;

(ii) agricultural development is restricted because of the shortage of labour; and,

(iii) opportunities for the realisation of human potential are limited because the out-migration of potential entrepreneurs and people with skills.

6.2.5 Education

A close link exists between education and development. Education enables people to access relevant information on how to improve themselves

(Cornwell, 2000:24). Information includes essential aspects of production such as skills, resources, technology and market. Education is thus seen as a potentially powerful tool in the struggle against poverty, deprivation and underdevelopment. Kotzé (2002:62) regards access to education as an important means of achieving human development. At 'independence' the homeland authorities of the former Transkei placed tremendous emphasis on education in an attempt to develop the sub-region (Bembridge, 1984:132).

The educational profile of the farmers at Qamata presented in Table 6.11 suggests that the farmers did not take adequate advantage of the opportunities offered by the authorities to acquire knowledge and skills to develop themselves and the local economy. The table reveals that the irrigation farmers are slightly better educated than the dryland farmers: 30,2% of the former and 22,0% of the latter have sufficient formal education to retain literacy and numeracy. The better educated people in the villages surrounding the irrigation scheme have migrated to look for employment elsewhere because of the harsh realities of dryland farming, common among which is crop failure caused by insufficient rainfall[43]. Irrigation farming requires a reasonable level of education because of the use modern techniques of production and inputs whose application necessitates the knowledge of scheduling for better results.

Table 6.11 Distribution of farmers according to level of education

Level of education	Irrigation farmers (%)	Dryland farmers (%)
Std 2 and below	30,2	18,6
Std. 3-6	39,5	60,4
Std. 7-9	14,4	14,0
Std. 10 (Matric)	7,9	2,3
Post matric	7,9	4,7
TOTAL	**100** (n_i=76)	**100** (n_d=43)

The table reveals three characteristics of the level of education of the farmers in the area:

(i) a significant proportion of the farmers (30,3% of irrigation farmers and 18,6% of dryland farmers) have little or no formal education;

[43] The researcher obtained this information at a group discussion with dryland farmers at Qamata Basin on 7 September 2005 (Appendix 9, item 17).

(ii) a further 39,5 % of irrigation farmers and 60,4% of dryland farmers have inadequate formal education to retain a reasonable degree of literacy and numeracy; and

(iii) the school drop-out rate is very high among the farmers. This reduces the long-term benefit of education.

According to IFAD (2001:5) previous education helps farmers to get better returns from irrigation. The implication is that as much as 79% of the dryland farmers and 69,8% of the irrigation farmers cannot participate in agricultural modernization programmes which require some degree of literacy and numeracy (Table 6.11). The burden of agricultural and community development is therefore borne by less than a third of the farmers.

The cross-tabulation of the level of education and gender structure of irrigation and dryland farmers (Table 6.12) shows that the female farmers are better educated than the male farmers: 76,7% of the male irrigation farmers have insufficient education compared with 60,6% of the female irrigation farmers. In the case of dryland farmers, the proportion was 87,5% of male farmers to 68,4% of female farmers. The observation is explained in terms of the need of young boys to herd livestock and the pressure on young men from poor families to leave school to look for employment (SA-PPA, 1997:56).

6.12 Levels of education and gender structure

Category of farmers	**Education qualification**	Gender of farmers	
		Males (%)	Females (%)
Irrigation	Std 2 and below	30,2	30,3
	Std 3-Std 6	46,5	30,3
	Std 7-Std 9	4,7	27,3
	Std 10	7,0	9,1
	Post matric	11,6	3,0
	TOTAL (n_i=76)	**100**	**100**
Dryland	Std 2 and below	12,5	26,3
	Std 3-Std 6	75,0	42,1
	Std 7-Std 9	8,3	21,0
	Std 10	0,0	5,3
	Post matric	4,2	5,3
	TOTAL (n_d=43)	**100**	**100**

The cross tabulation of the level of education and annual turnover of all agricultural activities presented in Table 6.13 shows that the farmers with low levels of education are concentrated in the lowest brackets of annual turnover; as the level of education increases, progressively fewer farmers are distributed to the higher brackets of annual turnover.

Table 6.13 Cross-tabulation: highest academic qualification and annual turnover of agricultural activities

Category of farmers	Education qualification	Total annual turnover of all farming activities							TOTAL (%)
		R0 - R5000 (%)	R5000 - R9999 (%)	R10000 - R14999 (%)	R15000 - R19999 (%)	R20000 - R24 999 (%)	R25000 - R29 999 (%)	R30000+ (%)	
Irrigation	Up to Std 2	65,2	21,7	13,1	0,0	0,0	0,0	0,0	30,3
	Std 3-Std 6	60,0	26,7	10,0	0,0	3,3	0,0	0,0	39,5
	Std 7-Std 9	0,0	36,4	63,6	0,0	0,0	0,0	0,0	14,4
	Std 10	0,0	50,0	33,3	0,0	0,0	0,0	16,7	7,9
	Post matric	0,0	33,3	0,0	16,7	16,7	16,7	16,7	7,9
	TOTAL (n_i=76)	**43,4**	**28,5**	**20,2**	**1,3**	**2,6**	**1,3**	**2,6**	**100**
Dryland	Up to Std 2	75,0	25,0	0,0	0,0	0,0	0,0	0,0	19,0
	Std 3-Std 6	46,2	30,8	19,2	3,8	0,0	0,0	0,0	59,5
	Std 7-Std 9	50,0	16,7	16,7	16,7	0,0	0,0	0,0	14,3
	Std 10	0,0	0,0	0,0	0,0	100,0	0,0	0,0	2,4
	Post matric	0,0	0,0	0,0	0,0	0,0	50,0	50,0	4,8
	TOTAL (n_d=43)	**48,8**	**25,6**	**14,0**	**4,7**	**2,3**	**2,3**	**2,3**	**100**

The results of the tests of association between levels of education and annual turnover of all agricultural activities in both irrigation and dryland farming are presented in Table 6.14. In the case of irrigation farming, the p-value is 0.019; since the p-value is less than the significance level of 0.05, the null hypothesis is rejected. This means that an association exists between the two variables: a change in the quality and levels of education of irrigation farmers is likely to results in a change in their annual turnover. It is interpreted to mean that an improvement in the levels of education of the irrigation farmers may result in improved annual turnover. The interpretation is based on the assumption that the other factors influencing agricultural productivity and marketing are present at the scheme. The p-value of the association of levels of education and annual turnover for the dryland farmers is 0.430 which is larger than the level of significance (0.05). The null hypothesis is accepted.

No association therefore exists between the two variables: improvement in the quality of education of the dryland farmers may not have any positive impact on annual turnover. What this means is that it is likely that most of the factors (e.g. farming skills, inputs, extension service, etc.) that promote agricultural productivity are lacking in the dryland farming communities.

Table 6.14 Summary of tests of hypothesis to assess the association between levels of education and annual turnover of all agricultural activities at Qamata

Farming category	Variables	p-value	Decision
Irrigation	Levels of education Annual turnover	0.019	Reject
Dryland	Levels of education Annual turnover	0.430	Accept

6.3 Livelihood practices

The concept of livelihood has been defined in diverse ways. The *Cambridge International Dictionary of English* (1995:832) defines livelihood as the way people earn the money they need to pay for food, a place to live, clothing, etc. De Haan (2000:343) however cautions that “livelihood is not necessarily the same as having a job and does not necessarily even have anything to do with working”. The implication of De Haan’s (2000:343) observation is that obtaining a monetary income is only one of the important aspects of livelihood. The other aspects include payment in kind, assets which generate returns both in cash and in kind and property rights that can sustain a given standard of living. Livelihood may therefore be conceptualised as capabilities, assets and activities required for a means of living

The findings on livelihood strategies and practices are presented in an ‘assets-processes-activities’ framework as defined above. The cultural landscape and the observable daily activities at Qamata suggest that the prevailing lifestyle is primarily farming: these include cultivated fields, crops growing in homestead gardens and livestock wandering about. However, the information presented in Table 6.15 suggests that farming alone is unable to provide a sufficient means of survival for the rural households. The households in Qamata area therefore engage in a number of socio-economic activities to ensure survival and to improve their standards of living. The underlying reason for the adoption of diversified income portfolios the farmers and heads of households at Qamata advanced during interviews[44] and at group discussions[45] relates the need to spread risk and reduce proneness to stress and shocks. The multiplicity of income and livelihood sources at Qamata have resulted in complex interactions between poverty, income distribution, agricultural productivity, environmental conservation and gender issues which are not easy to explain in a single study.

Table 6.15 Occupational distribution of farmers' heads of households

Employment/source of income	Irrigation farmers (%)	Dryland farmers (%)
Farming	59,3	30,3
Pension and disability grant	26,4	30,3
Commerce	1,3	2,3
Public service	3,9	6,9
Artisan	1,3	0,0
Informal sector	3,9	16,3
Unemployed	3,9	13,9
TOTAL	**100** (n_i=76)	**100** (n_d=43)

6.3.1 Primary household survival activities

The households which do not have secure means of livelihood (especially those headed by females and unemployed people aged over 60 years) extract resources from the veld and nearby forests for survival[46]. This observation confirms Ellis's (1999:4) assertion that the level of welfare of the rural people is inversely related to the need to extract natural resources for survival. The primary household survival activities provide materials for building and craftwork, firewood, crop wastes and cow dung for fuel and plants for traditional medicines and dietary supplements. Adams, Cousins and Manona (1999:29) estimate the average economic value derived from these activities to be R899,00 per annum per person. The demand and competition for these products are high and thus exceed the natural regenerative capacities of the veld and forests. The survival activities have become more tedious and time-

[44] The researcher obtained this information from interviews conducted at Qamata between July 2004 and October 2005 (Appendix 6, item 21).
[45] The researcher obtained this information at group discussions with irrigation farmers at QIS on 5 September 2005 (Appendix 8, item 5) and dryland farmers at Qamata Basin on 7 September 2005 (Appendix 9, item 5).
[46] The researcher obtained this information from interviews conducted at Qamata between July 2004 and October 2005 (Appendix 6, item 22).

consuming as the search has been extended further afield, with the consequent spread of environmental degradation and increasing risk of the women being attacked and raped.

6.3.2 Farming

Table 6.15 indicates that most of the households derive at least part of their livelihood from agriculture. Farming constitutes a major source of employment and income for the heads of households engaged in irrigation farming (59,3%) which is more than their counterparts in dryland farming (30,3%). Each of the homesteads in the area has a garden. The participants of the group discussion with the dryland farmers prefer to attend to homestead gardens rather than to the main fields because of the problems the farming industry faces especially insufficient rainfall and limited institutional support; they do not regard themselves as full-time farmers[47]. They maintain their landholdings as a buffer against future reductions in social grants and unforeseen problems to which they could respond by mortgaging their holdings. The distant fields are practically.

Over 90,0% of the farmers are engaged in subsistence farming (Table 6.3). As will be discussed in Section 7.2 of Chapter 7, the widespread nature of subsistence farming means that most of the farmers lack access to sufficient cash because there is little surplus farm produce to sell. Since they cultivate similar subsistence crops, chiefly maize, potatoes, beans, pumpkins and cabbage (Table 6.16), inter-household trade in farm produce is limited.

Table 6.16 Distribution of farmers according to three main crops cultivated

Crops	Irrigation farmers (%)	Dryland farmers (%)
Maize/potatoes/beans	46,1	13,9
Maize/potatoes/cabbage	32,9	25,6
Maize/beans/lucerne	11,8	4,7
Maize/beans/pumpkins	6,6	55,8
Maize/wheat/lucerne	2,6	0,0
TOTAL	**100** (n_i=76)	**100** (n_d=43)

[47] The researcher obtained this information at a group discussion with dryland farmers at Qamata Basin on 7 September 2005 (Appendix 9, item 5).

At separate group discussions with irrigation and dryland farmers, the general consensus was that almost every household has some kind of livestock (cattle, sheep, goats, poultry and pigs). Poultry and pigs are often sold for cash or slaughtered to provide meat for household consumption[48]. However cattle, sheep and goats are not meant for household consumption. They are sold when the household needs money in times of crisis or for performing rituals. Large livestock holdings and the ensuing overstocking have resulted in overgrazing of the veld (Plate 6.1). As indicated in Subsection 1.5.1.5 of Chapter 1, overgrazing is a major factor which causes soil erosion at Qamata. Cattle provide manure for cultivation (see Section 4.5.4 of Chapter 4) and the means for transportation (see Section 6.4.8 of Chapter 6) and traction (see Sections 4.5.1 of Chapter 4 and 7.3 of Chapter 7).

Plate 6.1 A herd of goats grazing on 'False Bushveld' at Rwantsana

6.3.3 Employment and incomes in the formal sector

The overall pattern of employment in the formal sector in South Africa in recent years is that fewer people are employed. From Table 6.15 it is evident that employment opportunity in the formal sector at Qamata is very limited.

[48] The researcher obtained this information at group discussions with irrigation farmers at QIS on 5 September 2005 (Appendix 8, item 6) and dryland farmers at Qamata Basin on 7 September 2005 (Appendix 9, item 6).

As low as 3,9% and 6,9% of the irrigation and dryland farmers have secured employment in the formal sector (Table 6.15). The public service is the only sector which offers employment and those employed work as teachers, policemen and nurses. It is apparent that the establishment of the irrigation scheme could not create sustainable employment opportunities in the agricultural and allied sectors, what the planning authorities had hoped for. The underlying causes of the paucity of employment opportunities at Qamata are summarised as follows[49]:

(i) the lack of natural resources for manufacturing and mining;
(ii) widespread subsistence farming;
(iii) poor state of the infrastructure; and,
(iv) low levels of education and the absence of a class of entrepreneurs.

6.3.4 The informal sector

Although the predominant economic activity is farming, the informal sector provides an avenue for some households at Qamata to meet their cash needs. The earnings of the employees and operators of the informal economic enterprises support the local economy through purchases of inputs and general demands for consumption (Yankson, 1992:242). Because the informal sector is poorly developed only a fraction of the households derives a livelihood from the sector. Table 6.15 indicates that 3,9% of the irrigation farmers and 16,3% of the dryland farmers are engaged in the informal sector. The varieties of the informal economic activities that operate at Qamata are[50]:

(i) petty trading (shebeens, spaza shops, and hawkers);
(ii) small-scale production and service units (dressmaking, shoe repairs, carpentry, auto repairs and welding);
(iii) small-scale construction works (brick-making and brick-laying); and,
(iv) transport services (taxis and bakkies for haulage).

From the group discussions with irrigation and dryland farmers, it was learnt that females outnumber males in the informal sector: petty trading is almost

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[49] The researcher obtained this information from interviews conducted at Qamata between July 2004 and October 2005 (Appendix 6, item 23).

[50] The researcher obtained this information at group discussions with irrigation farmers at QIS on 5 September 2005 (Appendix 8, item 7) and dryland farmers at Qamata Basin on 7 September 2005 (Appendix 9, item 7).

entirely dominated by females. However, some females are engaged in the local taxi industry, brick making and dressmaking. Kotzé (2002:63) argues that through their involvement in the informal sector, females play an important role in the provision of basic needs to the households. The informal sector thus plays a crucial role in rural development. It has the potential to reduce rural unemployment. Entry is easy because informal enterprises are not registered, they involve small-scale operations which do not require huge capital, and they are labour intensive and employ adapted technology (Kotzé, 2002:63; Yankson, 1992:242).

The high incidence of poverty and unemployment at Qamata may partly be attributed to the poorly developed nature of the informal sector. Entry into the informal sector is not as easy as purported. It is not easy to penetrate informal community networks, for example, to gain access to lucrative taxi routes or a space for hawking at busy spots or along the main road[51]. Moreover, as Aliber (2001:21) has noted the lack of capital and entrepreneurial skills present formidable barriers to entry.

6.3.5 Social grant and remittances

The state's social welfare grants are the second most important source of income for the households. Drawing again on Table 6.15, what one sees is that 26,4% and 30,3% of the heads of households of irrigation and dryland farmers respectively derive their income from old age state pensions and disability grants. The underlying reason is that most of the farmers surveyed are aged over 60 years and are due for pension. Figure 6.4 below indicates that only 13,2% and 9,3% of the households of irrigation and dryland farmers respectively do not have access to social grants.

The data obtained with regard to the amount and frequency of remittances suggests that presently remittances do not feature as an important source of household income as previously (Van Averbeke *et al*, 1998:116; Bembridge, 1984:248) because as little as 6,8% of the irrigation farmers and 2,4% of the

[51] The researcher obtained this information at group discussions with irrigation farmers at QIS on 5 September 2005 (Appendix 8, item 7) and dryland farmers at Qamata Basin on 7 September 2005 (Appendix 9, item 7).

dryland farmers receive regular remittances from relatives working elsewhere. The farmers attribute the inability of the migrant workers to remit their households back at Qamata to the harsh economic realities of urban life (specifically high rent and transport cost), retrenchments and unemployment.[52]

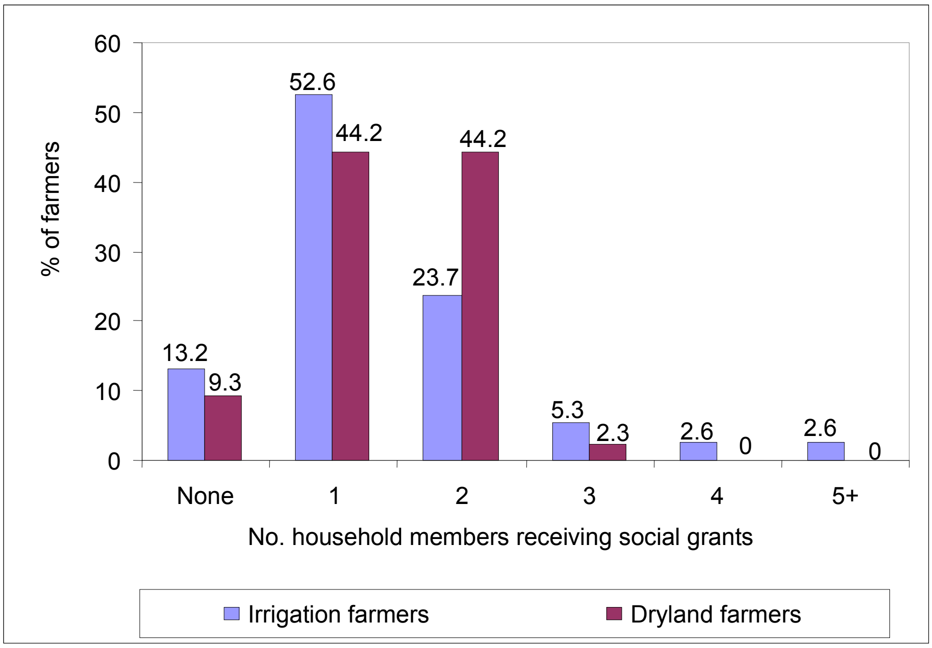

Figure 6.4 Access to state social grants

6.3.6 Assets

The farming households in Qamata area are generally very poor (ARDRI, 1996:17). Owing to widespread subsistence farming income generation in cash is very limited (see Section 6.3.2 of this Chapter). The prevailing socio-economic circumstances thus dictate that spending be confined to routine and basic items, ruling out almost entirely the chances of savings and the acquisition of assets (e.g. tractors and livestock) (Regan, 1996:53). However, assets are an integral part of the rural livelihood options and strategies (Bishop-Sambrook, 2004). For example, access to a tractor or land can generate multiple benefits for the household because a tractor or land can be used for direct productive ventures and also as collateral for loans. In the same way also, livestock can be used as productive capital (e.g. for animal

[52] The researcher obtained this information at group discussions with irrigation farmers at QIS on 5 September 2005 (Appendix 8, item 5) and dryland farmers at Qamata Basin on 7 September 2005 (Appendix 9, item 5).

traction or sale). Agricultural implements and equipment were the focus of the investigation of assets as their availability affects the productivity of all the farmers.

Access to assets required for agricultural production is particularly lacking at Qamata. None of the farmers who took part in the survey owns a tractor, mechanical plough or harvester (Appendix 1, item 79 and Appendix 2, item 77). According to ARDRI (1996:17) owing to the lack of access to these assets, "Securing land preparation timely is identified by many farmers as a major constraint at the Scheme". Substantial proportions of both categories of farmers claimed that limited access to equipment retards planting, harvesting and marketing operations (Table 6.17). In addition, access to other assets (e.g. vehicles, tools and equipment) needed to enter the informal sector are equally very few.[53] As indicated in Section 6.3.4 of this chapter, the poorly developed nature of the informal sector at Qamata may partly be explained in terms of the limited access to productive assets.

Table 6.17 Distribution of farmers according to their responses to the question '*Which of the following operations are limited by access to or maintenance level of equipment?*'

Operation	**Irrigation farmers (%)** (n_i=76)	**Dryland farmers (%)** (n_d=43)
Land preparation	100,0	100,0
Irrigation	86,8	0,0
Planting	85,5	100,0
Harvesting	89,5	100,0
Marketing	100,0	100,0

6.3.7 Credit

Credit sources are essential for farmers to overcome financial constraints. There is a lack of formal credit facilities at Qamata because there is neither a bank nor building society in the area. However access to cash is a problem owing to widespread subsistence farming (Table 6.3). One has to travel to either Queenstown or Cofimvaba to access formal credit-offering institutions, mostly commercial banks (Appendix 1, item 96 and Appendix 2, item 94). The

[53] The researcher obtained this information at group discussions with irrigation farmers at QIS on 5 September 2005 (Appendix 8, item 7) and dryland farmers at Qamata Basin on 7 September 2005 (Appendix 9, item 7).

effect is that smaller proportions of irrigation and dryland farmers operate banking accounts for their farming activities (Table 6.18).

Table 6.18 Distribution of farmers according to their responses to the question '*Do you operate any banking account for your farming activities?*'

Response	Irrigation farmers (%)	Dryland farmers (%)
Yes	27,6	7,0
No	72,4	93,0
TOTAL	**100** (n_i=76)	**100** (n_d=43)

With the closure of TRACOR which offered a debt-repayment-in-kind scheme for tractor services and inputs (ARDRI, 1996:24), no government department, NGO or parastatal offers credit directly to the irrigation and dryland farmers (Table 6.19). Only 5,3% of the irrigation farmers and 11,6% of the dryland farmers secure credit from cooperative societies. None of the dryland farmers and 23,7% of the irrigation farmers have access to credit offered by commercial banks and building societies. A significant proportion of the farmers who go for credit do so from local money lenders, traders and relatives and friends. However, 51,3% of the irrigation farmers and as much as 55,8% of the dryland farmers do not secure loans from any source (Table 6.19).

Table 6.19 Distribution of farmers according to sources of credit

Sources of credit	Irrigation (%)	Dryland (%)
Bank/building society	23,7	0,0
Agricultural cooperative society	5,3	11,6
Local money lender/cash loans	3,9	14,0
Relatives/friends/neighbours	6,6	7,0
Other (Traders)	9,2	11,6
None	51,3	55,8
TOTAL	**100** (n_i=76)	**100** (n_d=43)

The results of the tests of association presented in Table 6.20 suggest that an association exists between possession of bank account and sources of credit in the case of the irrigation farmers as the p-value is greater than the significance level of 0.05. However, for the dryland farming communities the null hypothesis is accepted because the p-value is larger than the significance level. This means that no association exists between possession of bank account and sources of credit in the case of the dryland farmers. The most probable interpretation of the observation is that the irrigation farmers who operate bank account have access to credit from the banks and the dryland farmers do not have access to credit offered by the banks because they do not operate any bank account.

Table 6.20 Summary of tests of hypothesis to assess the association between possession of bank account and sources of credit

Farming category	Variables	p-value	Decision
Irrigation	Possession of bank account Sources of credit	0.001	Reject
Dryland	Possession of bank account Sources of credit	0.513	Accept

The cross-tabulation of gender of farmers and sources of credit (Table 6.21) suggests that although female participation in agriculture is substantial, women have limited access to credit: 61,5% of the irrigation farmers and 58,3% of the dryland farmers who do not have access to credit are females. It has long been observed that women are more reliable in handling money than men (Bembridge, 1984:249). This observation is evident in Table 6.21. A substantial proportion of the farmers who take credit from relatives, friends, and neighbours are females; the credit from these sources is interest-free[54]. The general impression that emanates from Table 6.21 is that farmers' access to credit at Qamata is very limited. Without access to reasonably cheap credit the subsistence farmers are likely to remain unproductive (Office of the Executive Deputy President, 1998:247).

6.4 Basic needs and services

The investigation of the effects of irrigation technology transfer policy in agricultural and rural development is quite complex and requires detailed understanding of the processes and issues of rural life and economy. This section thus presents the research findings and analyses with respect to the

[54] The researcher obtained this information at group discussions with irrigation farmers at QIS on 5 September 2005 (Appendix 8, item 25) and dryland farmers at Qamata Basin on 7 September 2005 (Appendix 9, item 24).

extent to which the farmers at Qamata meet their minimum basic needs and services. By depicting the ease and success with which the people meet their essential needs and services in order to survive, this section seeks to provide important insights required to conceptualize the role of public policy in irrigation technology transfer and agricultural and rural development. The basic needs discussed here are housing, fuel and energy, water and sanitation, health, food and nutrition and recreation.

Table 6.21 Cross-tabulation: gender of farmers and sources of credit

Category of farmers	Source of credit	Gender		TOTAL (%)
		Male (%)	Female (%)	
Irrigation	Bank/building society	83,3	16,7	23,7
	Agricultural cooperative society	75,0	25,0	5,3
	Local money lender/cash loans	66,7	33,3	3,9
	Relatives/friends/neighbours	40,0	60,0	6,6
	Others (Traders)	85,7	14,3	9,2
	None	38,5	61,5	51,3
	TOTAL (n_i=76)	**56,6**	**43,4**	**100**
Dryland	Bank/building society	0,0	0,0	0,0
	Agricultural cooperative society	80,0	20,0	11,6
	Local money lender/cash loans	83,3	16,7	14,0
	Relatives/friends/neighbours	33,3	66,7	7,0
	Others (Traders)	80,0	20,0	11,6
	None	41,7	58,3	55,8
	TOTAL (n_d=43)	**55,8**	**44,2**	**100**

6.4.1 Standard of housing

Table 6.22 shows that 59,2% of the irrigation farmers and 23,2% of the dryland farmers live in traditional pole and thatch (rondavel) houses. Whereas the traditional houses at the scheme are constructed mostly with bricks and blocks, those in the dryland villages are constructed with mud and sticks. A close study of the table reveals that a greater proportion of dryland farmers live in semi-traditional buildings constructed with bricks and corrugated sheets than their counterparts engaged in irrigation farming. It appears then that the dryland farmers enjoy higher standards of housing than the irrigation farmers. What makes the observation pertinent is that standard of housing positively correlates with farming efficiency and output. The crux of the matter is that most of the houses with steel windows and corrugated sheets occupied by dryland farmers were built by relatives who worked elsewhere as migrant workers. The houses thus belong to their external families not to the individual dryland farmers occupying them.[55]

Table 6.22 Distribution of farmers according to type of housing

Type of housing	Irrigation farmers (%)	Dryland farmers (%)
Traditional (rondavel)	59,2	23,3
Semi-traditional	14,5	37,2
Brick and corrugated sheets	21,1	34,8
Modern (with tile roof)	5,3	4,7
TOTAL	**100,0** (n_i=76)	**100,0** (n_d=43)

A closer study of Table 6.22 reveals that a greater proportion (5,3%) of the irrigation farmers live in the more modern buildings than the dryland farmers (4,7%). The fact that some farmers (although few) occupy modern houses with tile roofs indicates that affluence coexists with poverty at Qamata. Most of the newly built modern buildings in the villages surrounding the irrigation scheme are not effectively occupied as the owners live elsewhere as migrant workers[56].

As a result of the extended family system, overcrowding is a major social problem at Qamata, especially in the villages surrounding the irrigation scheme where a substantial proportion of the households with over seven people use two bedrooms (Table 6.23). It appears the dryland farmers are unable to erect more buildings to accommodate adequately the growing number of household members. Although housing facilities are inadequate in

[55] The researcher obtained this information at a group discussion with dryland farmers at Qamata Basin on 7 September 2005 (Appendix 9, item 8).
[56] The researcher obtained this information at a group discussion with dryland farmers at Qamata Basin on 7 September 2005 (Appendix 9, item 8).

the area, because of the extended family system, homelessness does not constitute a problem: everybody belongs to a household[57]. The participants of all the group discussions attributed the high incidence of teenage pregnancy at Qamata to moral degeneration, and they blamed the latter on overcrowding[58].

Table 6.23 Cross-tabulation: number of people in the household and number of rooms used for sleeping purposes

Category of farmers	Number of people in the household	Number of rooms used for sleeping purposes					TOTAL (%)
		1	2	3	4	5+	
Irrigation	1-3	32,0	28,0	32,0	8,0	0,0	32,9
	4-6	29,6	44,4	22,2	3,7	0,0	35,5
	7-9	18,8	12,5	12,5	43,8	12,5	21,1
	10+	0,0	25,0	25,0	37,5	12,5	10,5
	TOTAL (n_i=76)	**25,0**	**30,3**	**23,7**	**17,1**	**3,9**	**100**
Dryland	1-3	0,0	66,7	33,3	0,0	0,0	7,0
	4-6	18,1	59,1	13,6	4,5	4,5	51,1
	7-9	0,0	83,3	8,3	8,3	0,0	27,9
	10+	0,0	66,7	16,7	16,7	0,0	14,0
	TOTAL (n_d=43)	**9,3**	**67,4**	**14,0**	**7,0**	**2,3**	**100**

The p-values of the tests of association between the number of people in the household and the number of rooms used for sleeping purposes for irrigation and dryland farmers are presented in Table 6.24. The p-value (0.001) in the case of the irrigation farmers is smaller than the significance level, indicating that an association exists between the number of people in the household and the number of rooms used for sleeping purposes. It appears that the irrigation farmers are able to build additional bedrooms to accommodate (though not adequately) increases in the household population. On the contrary, the p-value (0.572) of the dryland farmers is larger than the level of significance.

[57] The researcher obtained this information at a group discussion with dryland farmers at Qamata Basin on 7 September 2005 (Appendix 9, item 8).

[58] The researcher obtained this information at group discussions with extension officers at QIS on 2 September 2005 (Appendix 7, item 2), irrigation farmers at QIS on 5 September 2005 (Appendix 8, item 8) and dryland farmers at Qamata Basin on 7 September 2005 (Appendix 9, item 8).

The null hypothesis is thus accepted, meaning that no association exists between the two variables. The most likely interpretation is that the dryland farmers are unable to build additional bedrooms to accommodate increases in the population of their households.

Table 6.24 Summary of tests of hypothesis to assess the association between the number of people in the household and the number of rooms used for sleeping purposes

Category of farmers	Variables	p-value	Decision
Irrigation	Number of people in the household Number of rooms used for sleeping purposes	0.001	Reject
Dryland	Number of people in the household Number of rooms used for sleeping purposes	0.572	Accept

6.4.2 Fuel and energy

The most common forms of domestic fuel and energy used at Qamata are presented in Figure 6.5 below. The use of electricity is reasonably widespread: 32,9% of irrigation farmers and 16,3% of the dryland farmers have electricity in their homes. Access to electricity should not be attributed to the efforts of the farmers or the performance of the local economy but rather to the government's policy and programme of extending essential services to the rural people (Republic of South Africa, 1998; Republic of South Africa. 2000). The widespread use of television sets as sources of information and home entertainment is partly attributed to the increased access to electricity in the area. In the case of the irrigation farmers, 52,6 % have a television set and 35,5% a radio set; and in the surrounding rural communities the respective proportions are 18,6% and 79,1%. Usually radios powered by batteries are used by almost all rural households. The limited use of radios at Qamata may be explained in terms of poverty especially in the dryland farming communities.

Fewer households use electricity for cooking and heating. Firewood remains the most popular and important fuel for cooking and heating among dryland farmers (58,2%) while paraffin, regarded as more expensive and 'better' option, is used by 52,6% of the irrigation farmers (Figure 6.5). The observation confirms Huntley, Siegfried and Sunter's (1989:69) assertion that firewood and paraffin are most commonly used in rural areas. The recent increases in the price of paraffin is likely to have a devastating impact on the environment as more households would turn to firewood, cow dung and crop residues to provide domestic fuel. The collection of firewood, cow dung and crop residues is the responsibility of the women and young girls (Plate 6.2). Apparently the Eastern Cape Appropriate Technology Unit (ECATU), the parastatal charged with the development and transfer of simple technologies to the rural people, has not come out with any solution to the energy problem in the rural areas since its inception in1983.

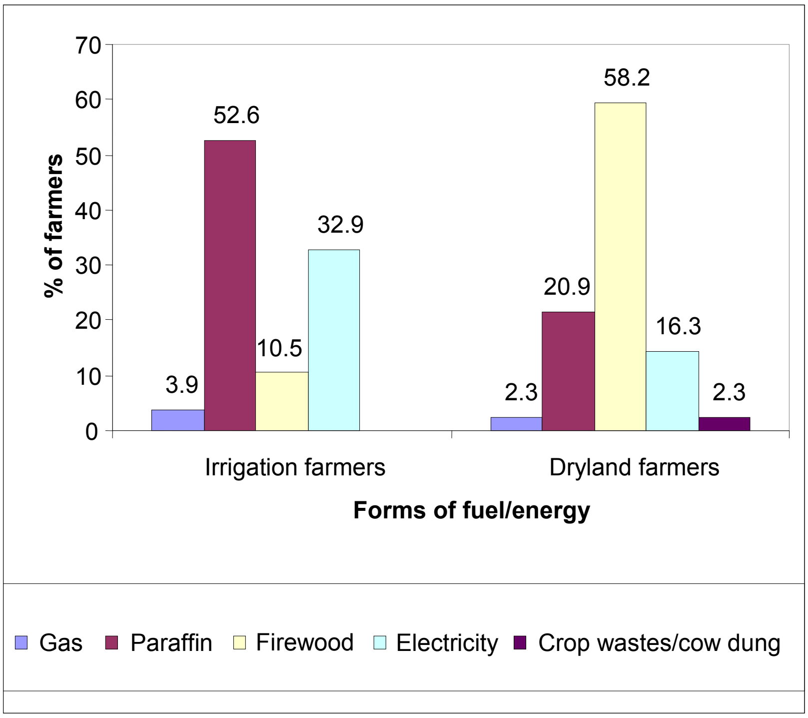

Figure 6.5 Distribution of farmers according to the type of domestic fuel used for cooking

The use of primary forms of energy (firewood, cow dung and crop residues) has far reaching consequences for the rural economy.

(i) As local supplies become scarce, the search for fuel reduces the amount of time women spend on farms although they bear the burden of food crop production for household consumption (ITDG, 2002:10; Gardner-Outlaw and Engelman, 1999:40).

(ii) The search for domestic fuel also consumes the energy and health of women. Females risk spinal column and uterine damage from carrying heavy loads over long distances (Gardner-Outlaw and Engelman, 1999:41).

(iii) The use of these forms of primary energy deprives livestock of fodder and soils of natural fertilizer (Gardner-Outlaw and Engelman, 1999:41).

(iv) The smoke from these forms of fuel endangers health of women and their families. Acute respiratory infections, ear and eye problems, breathlessness, chest pains, headaches and dizziness are some of the symptoms that rural woman and children suffer in their rural homes as a result of indoor pollution (World Health Organisation, 2002: Chapter 2; Gardner-Outlaw and Engelman, 1999:2, 41; ITDG, 2002:20, 28, 39).

(v) The excessive exploitation of firewood leads to deforestation, which in turn leads to soil erosion, floods and climate change, severe environmental degradation, and increasing poverty, deprivation and hunger (ITDG, 2002:10).

Plate 6.2 An elderly woman with a head load of firewood crossing the R61 (Mthatha-Queenstown road) at Qamata

The supply of electricity to the rural communities has somehow boosted the informal sector as additional services such as welding and grain milling are offered locally. Besides, the traders have extended trading hours because more powerful lights are now available and more importantly have expanded their merchandise to include perishable goods which hitherto could not be stocked. Because of the use of electric powered refrigerators and deep freezers, meat, poultry and dairy products are available in the rural shops[59].

[59] The researcher obtained this information from interviews conducted at Qamata between July 2004 and October 2005 (Appendix 6, item 24).

The fact that other forms of fuel such as petrol and diesel were not included in the survey does not mean that these forms of fuel and energy are not used at Qamata. Their exclusion from the above discussion is based on the fact that very few people acquire them directly for use in their vehicles and tractors. In addition, they do not have reliable records of consumption. For those who indirectly consumed petrol and diesel (e.g. those who hire tractor and use public means of transport), it is highly difficult (if not impossible) to accurately estimate their levels of consumption in a study of this magnitude.

6.4.3 Domestic water supply

Nowhere in the study area is treated pipe borne water available (Table 6.25). The irrigation canals provide water for domestic use for 89,5% of the irrigation farmers while the remaining 9,2% and 1,3% get their ration from boreholes and springs respectively. Springs are the main source of water supply in the surrounding villages; they provide water for 58,1% of the dryland farmers. About a third (32,6%) of the dryland farmers get their supply of domestic water from rivers and canals and 9,3% obtain their supply from boreholes. The water obtained from these sources is obviously contaminated, untreated and unsafe for drinking (Andreatta, 1994; UNICEF, 1989:48). The World Health Organisation (WHO) estimates that contaminated water accounts for 80% of the world's illnesses (Addison, 2005). According to the United Nations Children's Fund (UNICEF, 1989:48), the most common disease which affects children in developing countries is diarrhoea which is water-borne. It is thus true to argue that the provision of safe drinking water in rural areas is probably the most important factor that can dramatically improve public health.

Table 6.25 Distribution of farmers according to sources of domestic water supply

Sources of domestic water supply	**Irrigation farmers (%)**	**Dryland farmers (%)**
River/canal	89,5	32,6
Borehole	9,2	9,3
Spring	1,3	58,1
Treated pipe borne water	0,0	0,0
TOTAL	**100,0** (n_i=76)	**100,0** (n_d=43)

UNICEF has long recommended that unsafe water should be boiled before drinking (UNICEF, 1989:3). As Andreatta (1994) has observed, the recommendation is hardly followed, probably because of ignorance and scarcity of fuel. The finding at Qamata with respect to the issue is in congruence with Andreatta's (1994) observation. As much as 82,9% of the irrigation farmers (Appendix 1, item 44) and 74,4% of the dryland farmers (Appendix 2, item 44) do not boil nor add bleach to their drinking water as recommended. What makes the situation serious is that in the dry season, the farmers far away from the canals and boreholes draw water from stagnant pools in the riverbeds from which animals also draw their daily ration. The nurses[60] who participated in the study agreed that gastro-intestinal maladies such as diarrhoea and vomiting are common at Qamata. However, they are certain that cholera does not pose a threat in the area.

Women and young girls provide water for the household besides gathering firewood, crop wastes and cow dung for fuel. Water is fetched in the morning and in the late afternoon. Bembridge (1984:184) found that at Qamata those who fetch water travel on the average 1,5km from the homestead; the distance is longer in the villages on the slopes of the mountains. Water collection is therefore time-consuming and tedious.

6.4.4 Sanitation

The state of sanitation of an area gives an idea about its people and their dignity and health. Indeed, sanitary conditions in the countryside have a direct impact on the rural social economy as improved sanitary conditions "break the cycle of ill-health, lost income, foregone opportunities and economic impoverishment" (Department of Water Affairs and Forestry, 2002:10). The aspects of socio-cultural environment which were studied to establish the sanitary conditions at Qamata are (i) household and community toilet facilities, (ii) household refuse disposal and (iii) household surroundings.

The standard of sanitation at household and community levels is very low. Although the toilets in the area are of the VIP (ventilated improved pit) latrine

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[60] The researcher obtained this information from nurses interviewed at the clinics at St. Marks on 13 September 2005 and at Camama on 14 September 2005 (Appendix 6, item 26).

type, the households of 27,6% of the irrigation farmers and 47,6% of the dryland farmers do not have toilets. It was established that the members of the households which do not have toilets make do in the nearby dongas (gullies) and bushes[61]. Public toilets are a rare facility at Qamata: as low as 5,3% of the irrigation farmers (Appendix 1, item 45) and 20,9% of the dryland farmers (Appendix 2, item 45) have public toilets in their communities.

The sanitation status of the communities is indicated by the manner in which household refuse is disposed of. The households store their refuse in uncovered containers and plastic bags before finally disposing them in nearby veld or dongas since there are no refuse collection services or public incinerators[62]. Generally, the villages are satisfactorily clean except on windy days when refuse is scattered around the neighbourhood. The flying plastic bags which eventually land and hang on thorn bushes on the outskirts of the villages are euphemistically referred to as ‘Transkei flowers’ by the locals.

The seriousness of the sanitation situation is best grasped when one realizes that run-off washes the refuse into the canals, rivers and ponds which are important sources of domestic water supply. Unfortunately the majority of the people do not treat drinking water collected from these sources (as discussed in Section 6.4.3 of this chapter). Not surprisingly, 82,9% of the irrigation farmers (Appendix 1, item 47) and 69,7% of the dryland farmers (Appendix 2, item 47) hold the opinion that sanitary conditions in their communities adversely affect the health of their households.

6.4.5 Health

The World Health Organisation defines health as a “state of complete physical, mental and social well-being and not merely the absence of disease or infirmity” (United Nations Organisation, 1974:4). Implicit in this best-known

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[61] The researcher obtained this information from interviews conducted at Qamata between July 2004 and October 2005 (Appendix 6, item 27) and at group discussions with irrigation farmers at QIS on 5 September 2005 (Appendix 8, item 10) and dryland farmers at Qamata Basin on 7 September 2005 (Appendix 9, item 10).

[62] The researcher obtained this information from interviews conducted at Qamata between July 2004 and October 2005 (Appendix 6, items 28 and 29) and at group discussions with irrigation farmers at QIS on 5 September 2005 (Appendix 8, items 11 and 12) and dryland farmers at Qamata Basin on 7 September 2005 (Appendix 9, item 11 and 12).

definition of health is the notion of an interactive relationship between health, poverty and development. Poverty has a negative impact on health and access to effective health services. The incidence of poor health is higher among those who are poor (Office of the Executive Deputy President, 1998:105). The only productive resource poor people have at their disposal for generating income for livelihood is their labour. In poor rural communities, ill-health and disability are likely to ensnare individuals, households and communities in poverty or reduce their ability to escape poverty for long periods (Kellerman, 2000:184). In turn, poverty reduces access to health care (Department of Health, 1997:11). Poverty and ill-health are therefore mutually reinforcing. Measures to improve the health of the rural people are thus an indispensable aspect of any meaningful rural development strategy. Besides, access to affordable and quality health care is a fundamental human right (World Health Organisation, 1988:7; African National Congress, 1994:42-52).

The study focuses on proximity to rural health clinics and the district hospital at Cofimvaba to assess accessibility and affordability of health care and services and the diseases prevalent at Qamata. These issues have a profound actual or potential impact on poverty, deprivation and inequality as they are central to primary health care (Office of the Executive Deputy President, 1998:104). Access to medical facilities in the area is poor: 53,9% of the irrigation farmers (Appendix 1, item 38) and 62,8% of the dryland farmers (Appendix 2, item 38) do not have clinics in their communities. Besides, a visit to the district hospital at Cofimvaba is expensive for most rural dwellers. Figure 6.6 below indicates that over 75% of the farmers who participated in the study need more than R20,00 per individual to make a round trip to the hospital. The amounts shown in Figure 6.6 cover the cost of transport in one direction only.

What the above observation means is that availability and affordability of transport to the nearest clinic and the district hospital determine accessibility of medical services and facilities, assuming that treatment and other services at these government facilities are free. The mobile clinic is therefore an important health facility for the remote rural communities. The mobile clinic visits the communities of 60,5% of the irrigation farmers (Appendix 1, item 39) and 81,4% of the dryland farmers (Appendix 2, item 39) at Qamata. The mobile clinics are scheduled to visit the communities on a weekly basis but they are not regular[63]. Traditional healers provide alternative treatment for the poor households that cannot afford transport fares and the fees of private surgeries. Over a third of both irrigation and dryland farmers visited traditional healers at least once within the last three months[64].

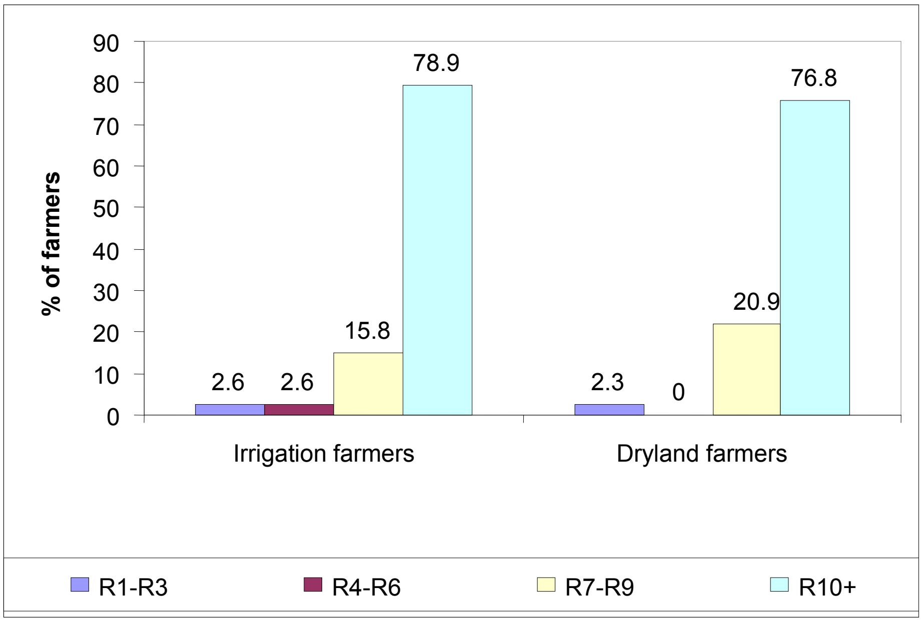

Figure 6.6 Distribution of farmers according to cost of transport to the District Hospital at Cofimvaba

The knowledge of the common diseases prevailing in an area suggests the quality of health care available and the direction public health policy should assume in the community. The pattern of disease encountered at Qamata is typical of rural Transkei (Bembridge, 1984:166). As illustrated in Table 6.26, the top four diseases identified by the respondents are high blood pressure, HIV/AIDS, diarrhoea and tuberculosis. The diseases are poverty related. The prevalence of high blood pressure is attributed to poor diet: high consumption

[63]The researcher obtained this information at group discussions with extension officers at QIS on 2 September 2005 (Appendix 7, item 4) and irrigation farmers QIS on 5 September 2005 (Appendix 8, item 13).
[64] The researcher obtained this information at group discussions with irrigation farmers at QIS on 5 September 2005 (Appendix 8, item 14) and dryland farmers at Qamata Basin on 7 September 2005 (Appendix 9, item 13).

of relatively cheaper animal fat and products with high concentration of fat and less intake of fruits and vegetables (Personal communication, Dr. J. R. Kankam, Queenstown Private Hospital on 29 April 2005). The prevalence of tuberculosis and other respiratory diseases in Qamata area is associated with poor living conditions and overcrowding (Tshabalala-Msimang, 2002). The diarrhoea and gastroenteritis are caused by malnutrition and the consumption of contaminated water and food (Kellerman, 2000:185-186). The high incidence of HIV/AIDS is blamed on ignorance, poor diet and unhygienic living conditions (Department of Water Affairs and Forestry, 2002:10; Office of the Executive Deputy President, 1998:111). It may also be attributed to unsafe sexual practices and inadequate access to clinics.

Table 6.26 Distribution of farmers according to diseases prevailing in their communities

Diseases	Irrigation farmers (%)	Dryland farmers (%)
High blood pressure	30,3	32,6
HIV/AIDS	25,0	20,9
Diarrhoea	18,4	16,3
Tuberculosis	17,1	20,9
Diabetes	7,9	7,0
Other	1,3	2,3
TOTAL	**100,0** (n_i=76)	**100,0** (n_d=43)

What is noteworthy about these diseases is that they are preventable through health education and awareness campaigns. However, health educators and health inspectors hardly visit the communities in the area[65]. The outcome of the sample t-test presented in Table 6.27 reveals that the irrigation farmers and their dryland counterparts share similar health conditions as the null hypothesis is accepted. The reason for this observation may be that they share similar health and medical facilities provided by the Department of Health and the local and district municipal authorities.

[65] The researcher obtained this information from interviews conducted at Qamata between July 2004 and October 2005 (Appendix 6, item 34).

Table 6.27 Summary of independent samples t-test which compares condition of health of the farmers in the irrigation and dryland farming communities at Qamata

Variables	t	p-value	95% Confidence Interval of the Difference		Decision
			Lower	Upper	
Condition of health	1.139	.257	-.11304	.41880	Accept H_o

6.4.6 Food and nutrition

Food and nutrition is generally concerned with the quality and quantity of food and the factors which influence its availability and quality and its relation to health and diseases. The World Bank defines food security as “access of all people at all times to enough food to have an active, healthy life” (Bernstein, 1994:3). Poverty is an important factor which causes household food insecurity. Therefore, food and nutrition is probably the most basic indicator of poverty (Coutsoudis, Maunder, Ross, Ntuli, Taylor, Marcus, Dladla and Coovadia, 2000:1). Food security is attained when poor and vulnerable people have guaranteed access to procure food at all times. Because food and nutrition are very important to good health, WHO regards access to food and nutrition as a basic human right (Coutsoudis *et al*, 2000:1) and the South African 1996 Constitution accords this right to all the citizens of South Africa through the Bill of Rights. Making food and nutrition accessible has thus become the focus of development efforts (Chopra, 2004:3).

In order to assess the impact of agricultural development on food and nutrition in the Qamata area, the study was designed to establish the frequency with which the households serve ‘full meals’. A ‘full meal’ is construed in this context to mean a balanced meal consisting of meat, chicken, pork or fish, vegetables and some reasonable quantity of carbohydrates. As evidenced by Figure 6.7, about a third of the farmers and their households (31,6% of irrigation farmers and 27,9% of dryland farmers) can afford a balanced meal at least once in three days. The figure again indicates that for 51,2% of the households of dryland farmers and 15,8% of those of the irrigation farmers putting a balanced meal on the table requires careful planning, and it happens once a month, probably when social grants are paid or when remittances are received or when household members in employment receive their wages and salaries. For those in the category of ‘Other’ they gain access to balanced meals mostly at social functions such as weddings, funerals, and more especially at circumcision ceremonies known in vernacular as *mgidi*.[66] These are the most vulnerable group of farmers who cannot afford a balanced meal on their own. The cross-tabulation of the frequency of ‘full meals’ and age of farmers reveals that those in the ‘Other’ category belong to the age group ‘60 and above years’ (Figure 6.8), emphasizing the vulnerability of the aged. The farmers in the ‘Other’ category are mostly female (granny) heads of households whose main source of income is old age pension; they are usually the breadwinners in their households[67]. The irrigation farmers who have access to full meal each other day are in the age groups forty years and above (Figure 6.8). These are the emerging commercial farmers who have access to cash. Those in the age groups below forty years have access to full meal weekly, fortnightly or monthly; they are subsistence farmers who are engaged in the informal sector[68].

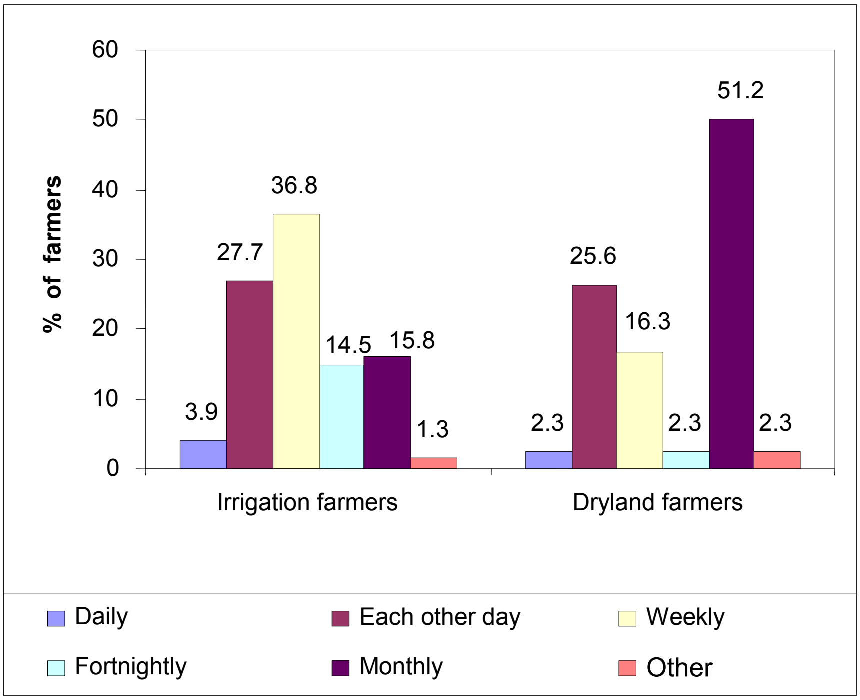

Figure 6.7 Distribution of farmers according to access to ‘full meals’

[66] The researcher obtained this information from interviews conducted at Qamata between July 2004 and October 2005 (Appendix 6, items 32) and at group discussions with extension officers at QIS on 2 September 2005 (Appendix 7, item 5), irrigation farmers at QIS on 5 September 2005 (Appendix 8, items 15) and dryland farmers at Qamata Basin on 7 September 2005 (Appendix 9, item 14).
[67] The researcher obtained this information at group discussions with extension officers at QIS on 2 September 2005(Appendix 7, item 5), irrigation farmers at QIS on 5 September 2005 (Appendix 8, item 15) and dryland farmers at Qamata Basin on 7 September 2005 (Appendix 9, item 14).
[68] The researcher obtained this information from a group discussion with extension officers at QIS on 2 September 2005 (Appendix 7, item 5).

Apart from the 'full meals', household meals consist mainly of maize. For the poorest households, milk is consumed in summer when there is enough grass and water for the cattle[69]. The findings give credence to Faber and Benadé's (2003:24) assertion that "The dietary intakes of economically and socially deprived communities in developing countries usually consist of plant-based staple foods, while fruits, vegetables and animal products are seldom consumed". Bembridge's (1984:166) study in the former Transkei confirms the notion that Qamata has serious nutritional problems.

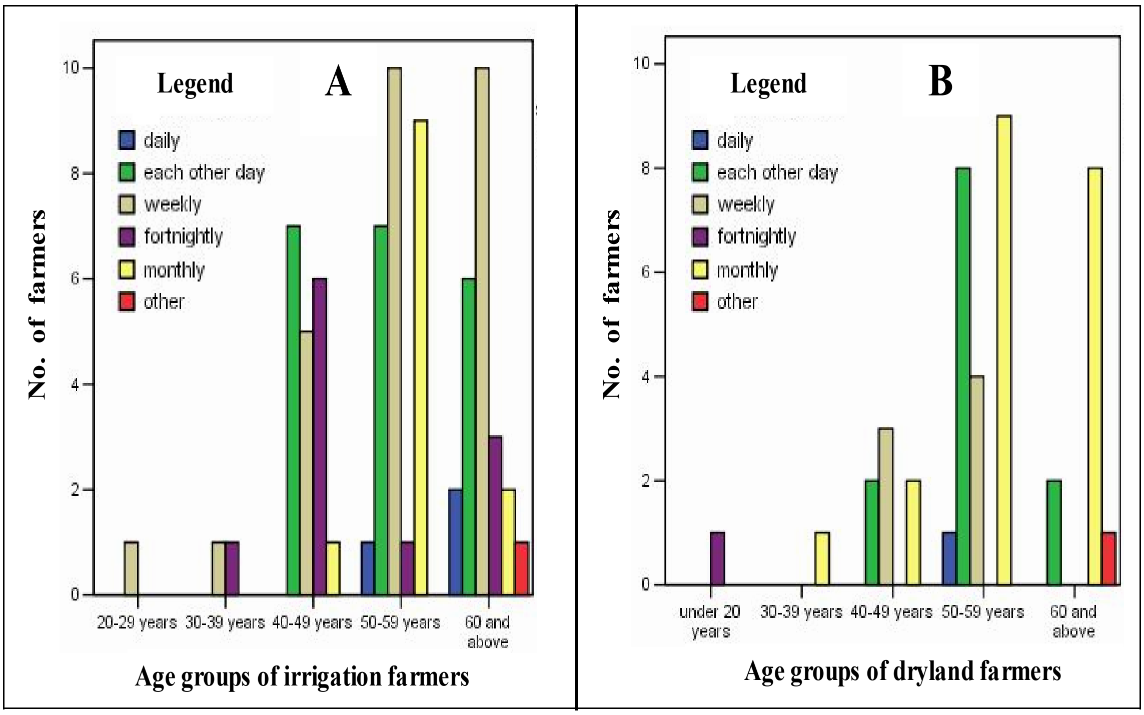

Figure 6.8 Distribution of farmers according to age and frequency of 'full meals'

In terms of the main source of household food supply, the independent samples t-test (Table 6.28) indicates that a significant difference exists between the two groups of farmers. The irrigation farmers are more food secure than the dryland farmers because of intensive cropping in the irrigation farming community. With proper planning and adequate production

69 The researcher obtained this information from interviews conducted at Qamata between July 2004 and October 2005 (Appendix 6, items 32) and at group discussions with extension officers at QIS on 2 September 2005 (Appendix 7, item 5), irrigation farmers at QIS on 5 September 2005 (Appendix 8, items 15) and dryland farmers at Qamata Basin on 7 September 2005 (Appendix 9, item 14).

techniques, the irrigation farmers stand a better chance to improve their sources of household food supply.

Table 6.28 Summary of independent samples t-test which compares the main source of household food supply in the irrigation and dryland farming communities at Qamata

Variables	t	p-value	95% Confidence Interval of the Difference		Decision
			Lower	Upper	
Main source of household food supply	-5.482	.000	-1.23849	-.58106	Reject H_o

6.4.7 Labour migration

Internal labour migration is a demographic process which is usually initiated and sustained by an unequal distribution of economic opportunities such as employment opportunities and natural resources in the national spatial system (Smit, 1998:79). According to the theories of Lewis (1954) and Fei and Ranis (1961) on development in dual economic systems, people migrate to cities when the expected urban wage exceeds that of the rural economy. Growing rural unemployment and poverty have forced more people out of impoverished villages in search of a livelihood in urban and commercial centres. Migration is an important survival strategy for many rural households, and DFID (2004: 1) laments that it "is rarely recognized in policies directed at poverty and inequality reduction". As discussed in Chapter 3, in South Africa the interplay of a series of secular policies largely accounts for the institutionalization of the culture of labour migration which has structured social relations for over a century. Two types of labour migration were encountered in the Qamata area, namely, rural-urban migration which involves the movement of people away from the area to the urban, mining, industrial and commercial centres in South Africa, and the local circular (seasonal) labour movement where people from the surrounding villages move to QIS to look for casual employment during the farming season and return to their homes at the end of the season.

6.4.7.1 Rural-urban migration

The previous system of migrant labour has been replaced by rural-urban migration in post-apartheid South Africa. With the abolition of restrictions on black urbanization in the 1980s, labour migrants from black rural areas prefer to migrate to and settle more or less permanently in the urban centres where they work (Posel, 2003:4). The role of migrant labour in agricultural and rural development is contentious. In the early 1960s and 1970s one school of thought was convinced that remittances from migrant workers had the potential to generate capital to spearhead rural transformation (Griffin, 1974:359; Byres, 1979:232). On the contrary, the second school of thought, basing its argument on recent studies, views internal migration patterns as having a devastating impact in the rural areas: rural underdevelopment and poverty are sustained largely by out-migration of able-bodied men, capital resources and entrepreneurs (Rempel, 1978: 336; Rakolojane, 2000: 26). The outcome of the survey gives credence to the latter contention.

Table 6.10 shows the extent of out migration in the study area. The table indicates that each of the households of the farmers who participated in the survey has at least a member working outside Qamata area. It is therefore true to argue that the area experiences a problem of depletion of human resources. However, only a small fraction of the households (6,6% and 2,3% of irrigation and dryland farmers respectively) receive remittances (Appendix 1, item 21 and Appendix 2, item 21).

The contribution of migrant workers is thus too small to stimulate agricultural and social development on any appreciable scale. The energetic people, mostly young men (Table 6.29), have migrated leaving the burden of agricultural and social development with women, the aged and children, yet remittances are too small to assist in the acquisition of labour-saving equipment to step up production. Feminization of rural poverty is therefore an important aspect of labour migration at Qamata.

Posel (2003:5) advances two reasons to explain the current decrease in remittances of labour migrants: (i) "… with urbanisation, migrants are likely to develop new and permanent ties that increasingly would crowd out remittances to households of origin"; and, (ii) "The extension of social pension to all South Africans … have reduced the need … for the migrants to remit".

Table 6.29 shows that between the ages 20years and 49 years, the proportions of female farmers are higher than their male counterparts. These age groups provide much of the farm labour required to ensure household food security. From 50 years upwards the proportion of male farmers exceeds that of the female farmers. The men return home when they are over 50 years of age at the time they cannot contribute effectively to farming.

Table 6.29 Cross-tabulation: gender and age of farmers

Category of farmers	Age group	Gender		TOTAL (%)
		Male (%)	Female (%)	
Irrigation	20-29	0,0	100	**1,3**
	30-39	50,0	50,0	**2,6**
	40-49	47,4	52,6	**25,0**
	50-59	60,0	40,0	**39,5**
	60+	62,5	37,5	**31,6**
	TOTAL (n_i=76)	**56,6**	**43,4**	**100**
Dryland	20-29	0,0	100	**2,3**
	30-39	50,0	50,0	**4,7**
	40-49	28,6	71,4	**16,3**
	50-59	59,1	40,9	**51,2**
	60+	72,7	27,3	**25,6**
	TOTAL (n_d=43)	**55,8**	**44,2**	**100**

Internal migration has also contributed immensely to the rapid spread of HIV/AIDS to the rural areas (DFID, 2004:1). It is not migration *per se* that spreads the disease; rather it is the social and economic circumstances that characterize migration processes that put people at risk (Southern African Migration Project 31, 2004). According to the Southern African Migration Project 31 (2004) those who are mobile spread the AIDS pandemic to the rural areas. "The role of migration in the spread of HIV to rural Africa has conventionally been seen as a function of men becoming infected while they are away from home, and infecting their wives or regular partners when they return" (Southern African Migration Project 31, 2004: Executive Summary). The nurses interviewed at the clinic at St Marks disclosed that the incidence of HIV/AIDS is on the increase as exemplified by the cases reported. Besides the migrants who return to the area with terminal sicknesses display symptoms of HIV/AIDS[70]. The participants at group discussions shared similar sentiments with respect to the spread of HIV/AIDS to Qamata area. They blame the spread of the disease to Qamata on those who return to the area from the cities and associate the current high death rate among young people at Qamata with HIV/AIDS[71].

6.4.7.2 Local circular labour movement

Labour is an essential input in small-scale agriculture because it is the primary source of power for most farm operations. Owing to outmigration of young men (noticeable in Table 6.29), seasonal farm labour shortages are experienced at Qamata. Local circular migrants provide relief for the emerging commercial farmers at the scheme and the surrounding villages.[72] They originate from the surrounding villages, nearby districts of Lady Frere and Cala and white-owned farms in Elliot, Indwe and Dordrecht “where poverty and drought have become unbearable” (Bank, 1992:91).

The numbers of unemployed people in the irrigation and dryland farming communities are different according to the independent samples t-test of significance (Table 6.30). However the rates of out-migration of people from the two communities are similar. According to the extension officers irrigation farming creates more jobs than the dryland farming.[73] Against this background, it can be inferred that the migrants from the dryland farming villages are forced to migrate to search for employment, whilst those from the irrigation farming community migrate in search of better opportunities. It thus appears that socio-economic conditions in the dryland farming villages are more intolerable and desperate.

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[70] The researcher obtained this information from interviews conducted at Qamata between July 2004 and October 2005 (Appendix 6, items 34).

[71] The researcher obtained this information at group discussions with extension officers at QIS on 2 September 2005 (Appendix 7, item 6), irrigation farmers at QIS on 5 September 2005 (Appendix 8, item 17) and dryland farmers at Qamata Basin on 7 September 2005 (Appendix 9, item 16).

[72] The researcher obtained this information at group discussions with irrigation farmers at QIS on 5 September 2005 (Appendix 8, item 18) and dryland farmers at Qamata Basin on 7 September 2005 (Appendix 9, item 17).

[73] The researcher obtained this information at a group discussion with extension officers at QIS on 2 September 2005 (Appendix 7, item 20).

Table 6.30 Summary of independent samples t-tests which compare unemployment and out-migration in the households in the irrigation and dryland farming communities at Qamata

Variables	t	p-value	95% Confidence Interval of the Difference		Decision
			Lower	Upper	
Unemployment in the household	-4.273	.000	-1.65377	-.60582	Reject H_o
Out-migration in the household	1.690	.096	-.06583	.78927	Accept H_o

6.4.8 Transport and communication

The role of transport and communication in rural development is to make goods, services and facilities not available in rural areas accessible to rural communities. It also grants rural entrepreneurs and investors access to information, innovations, inventions and urban markets and capital. Through improved access and mobility, rural communities are able to take advantage of opportunities elsewhere in the national spatial system and utilize social and economic services and facilities effectively to reduce poverty and deprivation (RTTP and Government of Malawi, 1999:1-2). Given this context, transport and communication is regarded intrinsically as a basic need and a catalyst for sustainable rural development (ICSID Interdesign, 2005:2). Owing to the huge capital requirement for their provision, infrastructure services such as roads, electricity and post and telecommunication services are usually provided by the state and/or private investors: their provision is entirely beyond the means of the rural people.

As discussed in Section 4.3.5 of Chapter 4, owing to organisational and institutional challenges infrastructure services, especially roads and transport at Qamata are inadequate to support or initiate and sustain socio-economic development. Besides, the existing infrastructure is poorly maintained (Qamata Trust, 2000:8). Apart from the Mthatha-Queenstown road (R63) which traverses the area, none of the access roads in the area is tarred. Figure 6.9 illustrates the impression of the farmers about the state of the roads linking the surrounding villages and the villages and farms. The majority of the farmers (85,5% of the irrigation farmers and 83,7% of the dryland farmers) regard the roads in the area as poor. Not surprisingly, 44,2% of dryland farmers rely on animal-drawn carts for most of their transport needs (Appendix 2, item 33) and 96,1% of irrigation farmers (Appendix 1, item 34) and 65,1% of dryland farmers (Appendix 2, item 34) suffer loss in production as the result of inadequate transport.

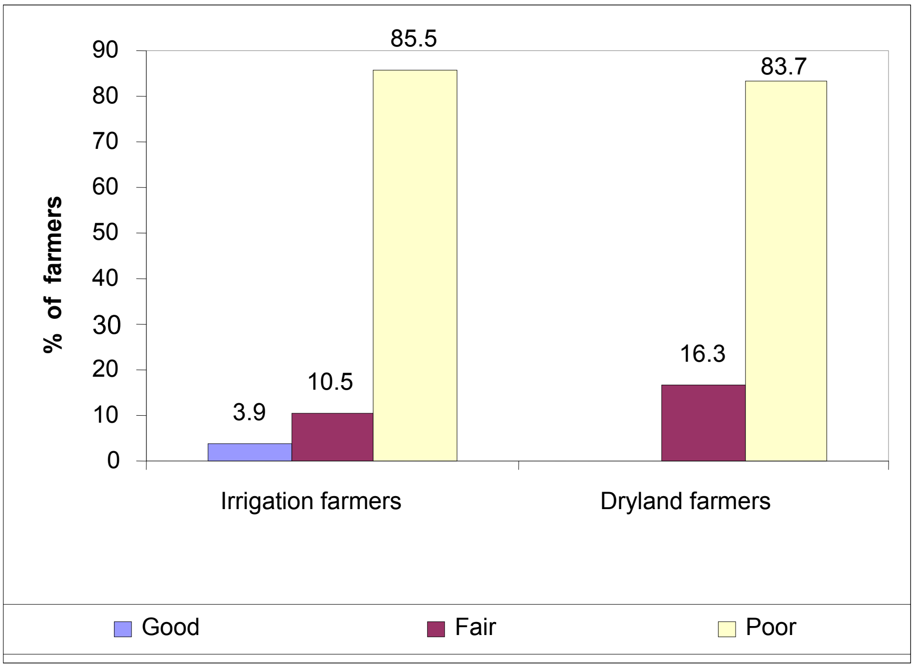

Figure 6.9 Impressions of farmers about the state of intra-village transport routes

Land line telephones services provided by Telkom are almost non-existent in the area: only 2,3% of dryland farmers (Appendix 2, item 35) and 14,5% of irrigation farmers (Appendix 1, item 35) have access to land line telephone services in their households, and 55,8% of the dryland farmers (Appendix 2, item 36) and 68,4% of the irrigation farmers (Appendix 1, item 36) have public land line telephone services in their communities. On the contrary, mobile telephones are commonly used: in 77,6% of the households of the irrigation farmers (Appendix 1, item 37) and 44,2% of those of the dryland farmers (Appendix 2, item 37) at least one member has personal mobile phone. The use of personal mobile phones by the farmers and their households at Qamata shows that the farmers are ready to adopt low-cost, modern technologies to improve their conditions of living. It appears the farmers are prepared to adopt and use new technologies that are simple, well-designed, appropriate, affordable and available.

6.4.9 Recreation and tourism

Two aspects of recreation and tourism at Qamata came under the spotlight in the study: (i) the availability of facilities for the local people to participate in pleasurable activities for the purpose of entertaining and refreshing themselves after a period of hard work; and, (ii) existing infrastructure for the development of tourism to diversify the local rural economy. Participation in recreational activities helps to improve both physical and mental vitality. Recreational facilities may include gymnasiums, sport fields, multipurpose centres, nature reserves and swimming pools. The availability of these facilities gives an indication of the level of welfare a community experiences.

Adequate recreational facilities are lacking in the Qamata area. Besides the multi-purpose centre at the Great Place which is monopolized by the traditional authority for holding meetings, there is no credible recreational facility in the area. People (mostly men) usually converge at weekends on recreational fields of the schools at the scheme and in the surrounding villages to watch local football matches. Shebeens (places where liquor and drugs are sold and consumed illegally) constitute the most popular recreational and entertainment facility in the area. The patrons of the shebeens spend a proportion of their household incomes on liquor and drugs. The majority of the participants of the group discussions with irrigation and dryland farmers associate the incidences of violent crimes and abuse of women and children to the proliferation of shebeens and the concomitant drunkenness in their communities[74].

The serenity of the area and the beautiful natural scenery of the Lubisi Dam, mountains and valleys (Plate 6.3) can be exploited to expand the local economic base. The definition of economic base in this context is broadened to include industries that cater for tourists (Loveridge, 2000:57). The influx of tourists into the area could result in structural change in the rural economy as many ventures could be established to cater for the varied needs of visitors.

[74] The researcher obtained this information at group discussions with irrigation farmers at QIS on 5 September 2005 (Appendix 8, item 19) and dryland farmers at Qamata Basin on 7 September 2005 (Appendix 9, item 18).

Plate 6.3 Lubisi Dam (CSIR, 2004)

The few tourist facilities in the area (e.g. the Lubisi Guest House and Conference Centre in Plate 6.4) are sparingly used as a result of poor management and reduced accessibility because of poor roads (an indication of inadequate institutional and organisational support). The contribution of tourism to the development of the area is therefore quite marginal.

6.5 Summary

From the above presentation of the socio-economic profile of Qamata, it is evident that the physical environment, quality of human resources and institutional factors have a profound impact on the livelihood practices and strategies of the inhabitants and how they meet their basic needs and services. The data presented clearly suggests that the factors which influence agricultural and rural development are certainly a multi-variant phenomenon. The preponderance of the aged in farming suggests that the shortage of farm labour places formidable constraints on production, taking cognizance of the fact that labour-saving agricultural machinery is beyond the means of most farmers. Subsistence farming is therefore widespread. However, subsistence farming restrains successful transfer of irrigation technology to the farming population as the techniques of production that come with it require huge capital resources and an all-year supply of skilled labour. Moreover, the low levels of education and training of the majority of the farmers affect the success of irrigation technology transfer at Qamata.

Plate 6.4 The Lubisi Centre: Guest House and Conference Centre (CSIR, 2004)

The dearth of employment opportunities and preponderance of subsistence farming at Qamata suggest widespread poverty. An appreciable proportion of the households cannot afford a balanced diet. The widespread use of contaminated water adversely affects the health of the people and reduces their ability to escape poverty.

The poor state of infrastructure facilities and services has also contributed significantly towards the underdevelopment of the area. For instance, the beautiful landscape, serene environment, the impressive Lubisi Dam and hospitality services and the unique cultural practices of the local people remain inaccessible to tourists because of poor access roads. What this means is that inadequate organisational and institutional support and services prevent the diversification of the local economy, making it perpetually dependent on subsistence agriculture.

The next chapter presents and analyzes the aspects of the research findings that deal with the impact of irrigation technology on farming practices and production at Qamata. This chapter compares the basic features of irrigation and dryland farming practices in relation to the impact of irrigation technology transfer at Qamata.

CHAPTER 7

AGRICULTURAL DEVELOPMENT AT QAMATA

7.1 Introduction

The research findings on farm practices including techniques of production, extension services and policy and decision-making at Qamata Irrigation Scheme are presented in this chapter. The aim of Chapter 7 is to provide the context for analyzing the efficacy of the irrigation technology transfer and development policies in improving techniques and methods of farm production in order to reduce rural poverty, food insecurity and unemployment at Qamata. Irrigation farming practices at QIS are compared to those in the dryland farming communities to assess the influence of QIS on agricultural development and production in the Qamata area. The contention is that the introduction of irrigation farming should render farm practices at the scheme radically different from the traditional farming practices that are associated with dryland farming and the irrigation farmers should be economically better off than their dryland counterparts. Some carefully selected responses from the questionnaires for irrigation and dryland farmers are analyzed qualitatively and quantitatively to verify the contentions.

7.2 Scale of agricultural production

As noted in Section 4.3.1 of Chapter 4, the origin of the differences in the scales of agricultural production at QIS lies in the development policy which guided land allocation at the scheme. There was a deliberate effort to create two groups of farmers at QIS through the system of land allocation: subsistence or food crop farmers and commercial or large-scale farmers. One is thus inclined to believe that the development of QIS was not intended to establish an egalitarian community but one which is marked by inequality. Table 6.3 reveals the preponderance of subsistence farming at Qamata: 92,1% and 90,7% of irrigation and dryland farmers respectively are engaged in subsistence farming. The proportion of the farmers at Qamata who are engaged in subsistence farming is similar to that of the Eastern Cape (see Section 1.1 of Chapter 1). The widespread nature of subsistence farming in the dryland farming communities is partly due the effects of the 1913 Native

Land Act and 1936 Native Trust and Land Act as discussed in Section 3.4.2 of Chapter 3.

The responses to the enquiries relating to scale of production, annual turnover of agricultural production and sources of household food supply are used to analyse the effect of the scale of agricultural production at Qamata. Annual turnover and the main source of household food supply are used to represent farmers' access to cash and household food security respectively (see Sections 6.1.2 and 6.1.3 of Chapter 6). The effects of widespread subsistence farming on access to cash are presented in Table 7.1 below.

Table 7.1 Cross-tabulation: scale of production and annual turnover of all agricultural activities

Category of farmers	Scale of operation	Total annual turnover of all farming activities							TOTAL (%)
		R0 - R5000 (%)	R5000 - R9999 (%)	R10000 - R14999 (%)	R15000 - R19999 (%)	R20000 - R24 999 (%)	R25000 - R29 999 (%)	R30000+ (%)	
Irrigation	Subsistence	47,1	31,4	21,4	0,0	0,0	0,0	0,0	**92,1**
	Commercial	0,0	0,0	0,0	16,7	33,3	16,7	33,3	**7,9**
TOTAL (n_i=76)		**43,5**	**28,5**	**20,2**	**1,3**	**2.6**	**1,3**	**2.6**	**100**
Dryland	Subsistence	53,8	28,2	15,4	0,0	2,	0,0	0,0	**90,7**
	Commercial	0,0	0,0	0,0	50,0	0,0	25,0	25,0	**9,3**
TOTAL (n_d=43)		**48,8**	**25,6**	**14,0**	**4,7**	**2,3**	**2,3**	**2,3**	**100**

From Table 7.1 it is evident that the majority of the farmers in both categories are concentrated in the lowest three brackets of annual turnover: there is a marked inequality in the distribution of annual turnover. The implication is that the majority of the farmers at Qamata have limited access to cash through the sale of farm produce. If the access of the majority of the farmers to cash through the sale of farm produce is limited, then the farmers in question are poor. The gravity of the poverty situation at Qamata is best grasped when one considers the annual turnover of all agricultural activities with the average size of the households of the irrigation farmers (5,3 persons per household) and the dryland farmers at Qamata (4,1 persons per household) (see Section 6.2.4 of Chapter 6) and the poverty datum line (R376 per person per month) (see Section 1.1.1 of Chapter 1). From the above information, an average irrigation farmer's household requires R23 913,60[75] to survive and a dryland

[75] The average minimum amount a household at QIS requires to survive is given by 5,3 persons x 12 months x R376 =R23 913,60.

farmer's household requires R18 499,20[76]. What one gleans from Table 7.1 is that over 93,5% of the irrigation farmers and their households and 93,1% of the dryland farmers and their households live below the poverty line. The establishment of QIS has, therefore, not contributed much to poverty alleviation at Qamata. The heads of the farmers' households thus engage in other activities to supplement their earnings from farming (see Section 6.3).

It appears that a greater proportion of the irrigation farmers (76,5%) produce most of their households' food requirements (Table 7.2). If the main source of household food supply is interpreted as household food security (see Section 6.1.3 of Chapter 1) then the households of 64,1% of the dryland farmers engaged in subsistence farming experience food insecurity problems. Table 7.2 reveals that subsistence farmers at Qamata diversify their farming activities to ensure household food security: the farmers who are also engaged in community gardens are all subsistence farmers.

Table 7.2 Cross-tabulation: scale of production and main source of household food supply

Category of farmers	**Scale of operation**	**Main source of household food supply**			**TOTAL (%)**
		Household farming operation (%)	**Community garden (%)**	**Buy from the shops (%)**	
Irrigation	Subsistence	75,7	2,9	21,4	**92,1**
	Commercial	83,3	0,0	16,7	**7,9**
	TOTAL (n_i=76)	**76,3**	**2,6**	**21,1**	**100**
Dryland	Subsistence	33,3	2,6	64,1	**90,7**
	Commercial	75,0	0,0	25,0	**9,3**
	TOTAL (n_d=43)	**37,2**	**2,3**	**60,5**	**100**

Chi-square tests are performed to establish whether associations exist between the scale of agricultural production and annual turnover and the source of household food supply for the irrigation and dryland farmers. Table 7.3 displays the results of the tests.

[76] The average minimum amount a household in the dryland farming community at Qamata requires to survive is given by 4,1 persons x 12 months x R376 =R18 499,20.

Table 7.3 Summary of tests of hypotheses to assess the association between the scale of farm production and annual turnover and sources of household food supply

Category of farmers	Variables	p-value	Decision
Irrigation	Var. 1: Scale of production Var. 2: Annual turnover of agricultural activities	.001	Reject H_o
	Var. 1: Scale of production Var. 2: Sources of household food supply	.457	Accept H_o
Dryland	Var. 1: Scale of production Var. 2: Annual turnover of agricultural activities	.410	Accept H_o
	Var. 1: Scale of production Var. 2: Sources of household food supply	.759	Accept H_o

The following observations are made from the table:

(i) In the case of the test for association between scale of production and annual turnover of the irrigation farmers, the null hypothesis (H_o) is rejected because the p-value of 0.001 is less than the level of significance set at 0.05. It implies that an association exists between the scale of production and annual turnover of agricultural activities. The observation is interpreted to mean that at QIS, annual turnover is a function of scale of production: expanding the scale of production generates more surpluses for sale. The corresponding p-value of similar test for the dryland farmers is 0.410 which means that no association exists between the two variables. It may be interpreted to mean that the other factors which favour agricultural production and sale of farm produce are so lacking that expanding the scale of production alone may not have any appreciable impact on the annual turnover of the dryland farmers.

(ii) The p-value of the test for association between scale of production and source of household food supply for the irrigation farmers is 0.457 and for the dryland farmers it is 0.759: the null hypothesis is accepted in each case. The indication is that there is no association between scale of production and source of household food supply at Qamata. The additional food which is produced by the irrigation farmers as a result of expansion in the scale of production is sold to pay for the additional production costs incurred. Indeed 60,9% of the irrigation farmers (Appendix 1, item 80) and 66.7% of the dryland farmers (Appendix 2, item 79) regard production cost as the single most important factor that affects their farming operations. The household food security is thus not improved by an increase in the scale of production. As much as 70,5% of the irrigation farmers provide for their household food requirements directly from their farming operations and over a quarter of the farmers purchase food to meet their requirements. Owing to small-scale agricultural production, household food insecurity constitutes a major problem as most households are vulnerable to the stresses and shocks of the agricultural industry and globalisation. The methods of agricultural production at Qamata appear to be inappropriate as the farmers cannot benefit from large-scale farming.

The impression one gets from the analysis of scale of production, annual turnover of agricultural activities and the main source of household food supply is that agricultural production falls short of household food requirements and the situation is worse with subsistence farmers in the dryland farming communities. Besides, turnover from farming is small. It is thus true to argue from inference that agricultural output is low at Qamata.

7.3 Methods of land preparation (ploughing)

As discussed in Section 4.5.1 of Chapter 4, the use of animal draft power for ploughing is shunned by the irrigation farmers as they ascribe modernity and progress to the use of mechanical ploughs (Table 7.4). Besides, the use of animal draft power is tedious and time consuming (Personal communication, Mr. Dingiswayo at QIS on 9 November 2005).

Table 7.4 Distribution of farmers according to methods of ploughing

Category of farmers	Methods of ploughing		TOTAL (%)
	Tractor (%)	Animal power (%)	
Irrigation	100	0,0	100 (n_i=76)
Dryland	67,4	32,6	100 (n_d=43)

However, there is a shortage of mechanical ploughs at Qamata and the work-party system offers only a partial solution to the problem[77]. A higher demand

[77] The researcher obtained this information at group discussions with extension officers at QIS on 2 September 2005 (Appendix 7, item 8), irrigation farmers at QIS on 5 September 2005 (Appendix 8, item 20) and dryland farmers at Qamata Basin on 7 September 2005 (Appendix 9, item 19).

for tractors especially in late winter and early spring hikes up rental fees for tractors which inevitably contribute to high costs of agricultural production at the scheme. The shortage of tractor services is an indication of inadequate institutional and organisational support. Owing to the relentless shortage of tractor services and endemic poverty, most farmers are accustomed to planting their crops late in the planting season. However, late planting has disastrous consequences for crop yields as late crops are attacked by insects and pests whose population usually doubles by mid-summer. In terms of land preparation, the scheme has nurtured a taste for equipment and machinery which cannot be satisfied but at the same time undermines the use of available traditional resources, methods and practices. The establishment of the scheme has, therefore, not brought relief in terms of land preparation to the farmers: the technology it introduced cannot be easily accessed because of high costs and non-availability of the necessary resources (see Section 1.4 of Chapter 1). The problem is perhaps much less serious in the dryland farming community in the surrounding villages where the shortage of mechanical ploughs and allied services is mitigated by the use of animal draft power (Table 7.4).

The responses to annual turnover and access to tractor and planter are used to analyse the effects of resources on agricultural production at QIS. The tests of hypotheses whose results are presented in Table 7.5 are designed to verify the contention that the output at QIS depends on the availability and use of local resources (see Section 1.4 of Chapter 1). In the tests, resources are represented by tractor and planter which are identified by the irrigation farmers as the two most important pieces of equipment at QIS[78], and output by annual turnover (see Section 6.1.2 of Chapter 6). The tests are carried out against the background of prevailing market conditions.

The p-values of the tests of association between annual turnover and access to tractor and planter show that there is an association between access to tractor and annual turnover and also between access to planter and annual turnover (Table 7.5). It implies that annual turnover depends on the availability

[78] The researcher obtained this information at a group discussion with irrigation farmers at QIS on 5 September 2005 (Appendix 8, item 20).

and use of the two resources: as more of the two resources are employed, surplus available for sale increases. However, it should be noted that as more resources are used, the cost of production increases because the additional resources employed must be paid for. The underlying reason is that the resources are not indigenous and are therefore expensive. As their use increases, more financial resources are expended for their procurement thereby rendering agricultural production in the community unviable and unsustainable. This observation confirms the outcomes of the statistical analyses discussed in Section 7.2 of this chapter. What the establishment of the scheme has succeeded in doing at QIS is to induce the people to lose confidence and hope in the use of local resources such as animal draft power.

Table 7.5 Summary of tests of hypotheses to assess the association between selected resources (tractors and planters) and annual turnover at QIS

Variables	p-value	Decision
Var. 1: Access to tractor Var. 2: Annual turnover	.010	Reject H_o
Var. 1: Access to planter Var. 2: Annual turnover	.025	Reject H_o
Var. 1: Reliability of market Var. 2: Annual turnover	.539	Accept H_o

The p-value of the test of association between reliability of market and annual turnover is 0.539 (Table 7.5). The fact that the p-value is greater than 0.05 (the level of significance) means that there is no association between the two pairs of variables. This means that the prevailing market conditions do not influence annual turnover. The market is small and does not provide the required incentives for the farmers to increase production. There is no centrally organised market with guaranteed producer prices for local agricultural produce. The absence of a centrally organised market is a reflection of inadequate institutional and organisational support.

7.4 Application of fertilizers

The responses to application of fertilizer are compared to those of annual turnover of agricultural production and sources of household food supply to establish the effect of the use of fertilizers at Qamata. The analysis is premised on the supposition that the correct application of fertilizers in crop farming leads to increases in output. Increases in output improve households' access to food and surpluses for sale to boost turnover of agricultural activities. It is therefore expected that there is causal relationship between the application of fertilizers and annual turnover and the application of fertilizers and source of household food supply. As indicated in Table 7.6, the greater majority of the farmers at Qamata apply fertilizers on their fields. However, the proportion of dryland farmers who apply fertilizers for cultivation is comparatively smaller. Some of the dryland farmers prefer manure to artificial fertilizers because the former is free[79]. Nonetheless, the extension officers hold the opinion that the amount of manure the farmers apply per unit area is usually too small to have a significant impact on output[80].

Table 7.6 Distribution of farmers according to their responses to the question, '*Do you apply fertilizer(s) on your plot*?'

Category of farmers	**Responses**		**TOTAL (%)**
	Yes (%)	**No (%)**	
Irrigation	96,1	3,9	100 (n_i=76)
Dryland	79,1	20,9	100 (n_d=43)

For the irrigation farmers, the chi-square test performed between the application of fertilizers and annual turnover (Table 7.7) shows that the null supposition is accepted because the p-value is 0.689. However, the test performed between the application of fertilizers and source of household food supply yields a p-value of 0.002: the null hypothesis which states that there is no association between the application of fertilizers and source of household food supply is thus rejected. The apparent lack of association between the application of fertilizers and annual turnover means that the application of fertilizers does not lead to increases in annual turnover because the additional yield is used for household consumption. The increases in output are therefore not substantial enough to generate surplus for sale to have an impact on annual turnover. However it appears that intensive farming at the

[79] The researcher obtained this information at a group discussion with dryland farmers at Qamata Basin on 7 September 2005 (Appendix 9, item 20).
[80] The researcher obtained this information at a group discussion with extension officers at QIS on 2 September 2005 (Appendix 7, item 9).

scheme is a more reliable means to improve the households' source of food supply than is expansion in scale of production. The high association between the application of fertilizers and the source of household food supply shows that at QIS the use of appropriate fertilizer types improves the access of the rural households to food.

Table 7.7 Summary of tests of hypotheses to assess the association between the application of fertilizers and annual turnover and source of household food supply

Category of farmers	Variables	p-value	Decision
Irrigation	Var. 1: Application of fertilizers Var. 2: Annual turnover	.689	Accept H_o
	Var. 1: Application of fertilizers Var. 2: Source of household food supply	.002	Reject H_o
Dryland	Var. 1: Application of fertilizers Var. 2: Annual turnover	.171	Accept H_o
	Var. 1: Application of fertilizers Var. 2: Source of household food supply	.331	Accept H_o

When similar tests are performed between the same sets of variables under dryland farming, the null hypotheses are accepted because the p-values are each greater than 0.05 as indicated in Table 7.7. What this observation means is that the application of fertilizers does not have an impact on annual turnover and source of household food supply in the dryland communities; probably either the dryland farmers do not apply the correct type of fertilizers at the right time or the 20,5% who do not use fertilizers use manure in insufficient quantities.

7.5 Control of insects and pests

The responses to control of insects and pests are analysed with reference to those of annual turnover and source of household food supply. The contention is that the impact of irrigation technology transfer should be manifested in a more effective control of insects and pests at the scheme than in the dryland farming communities. Both the irrigation farmers and dryland farmers control insects and pests on their fields (Table 7.8). However, almost all the irrigation farmers (97,4%) make attempts to destroy insects and pests which attack crops. As noted out in Section 4.5.3 of Chapter 4, many dryland farmers practise integrated insects and pests control through inter-cropping.

Table 7.8 Distribution of farmers according to their responses to the question, '*Do you control insects and pests on your plot*?'

Category of farmers	**Control of insects and pests**		**TOTAL (%)**
	Yes (%)	No (%)	
Irrigation	97,4	2,6	100 (n_i=76)
Dryland	86,0	14,0	100 (n_d=43)

The null hypothesis for the association between the control of insects and pests and annual turnover for the irrigation farmers is rejected as the p-value (0.012) is lower than the level of significance (Table 7.9). The control of insects and pests is likely to lead to increased annual turnover: the damage caused by insects and pests is reduced making it possible for more produce to be sold. The p-value of the test of association between the control of insects and pests and source of household food supply is 0.555; the null hypothesis is thus accepted. The control of insects and pests, on the contrary, does not have any bearing on the main source of household food supply: the increase in the output is sold to defray the additional cost of production and is not available for household consumption.

Table 7.9 Summary of tests of hypotheses to assess the association between the control of insects and pests and annual turnover and source of household food supply

Category of farmers	**Variables**	**p-value**	**Decision**
Irrigation	Var. 1: Control of insects and pests Var. 2: Annual turnover	.012	Reject H_o
	Var. 1: Control of insects and pests Var. 2: Source of household food supply	.555	Accept H_o
Dryland	Var. 1: Control of insects and pests Var. 2: Annual turnover	.179	Accept H_o
	Var. 1: Control of insects and pests Var. 2: Source of household food supply	.008	Reject H_o

In the dryland farming communities, no association exists between the control of insects and pests and annual turnover as the null hypothesis is accepted (Table 7.9); however there is an association between the control of insects and pests and source of household food supply. The control of insects and pests reduces crop damage and leads to increases in output, making more food available for household consumption. Thus while the irrigation farmers sell the additional produce resulting from the control of insects and pests because of the need to defray costs, the dryland farmers use the increase in output to feed their households. It appears the methods of control of insects and pests (integrated insect and pest management through inter-cropping) adopted by the dryland farmers are more cost effective than those used by their irrigation counterparts.

7.6 Weed control

The responses to methods of weed control are used in the analysis. The common method of weed control at Qamata is hoeing (Table 7.10). The use of herbicides by 22,4% of irrigation farmers represents an attempt to cope with farm labour shortages at the scheme. However the irrigation farmers hold the opinion that the methods of weed control at the scheme do not differ from weed control practices in dryland farming[81]. The dearth of equipment at QIS is exemplified by the absence of mechanical means of controlling weeds at the scheme.

Table 7.10 Distribution of farmers according to methods of weed control

Methods of weed control	Irrigation farmers (%)	Dryland farmers (%)
Hoeing	76,3	97,4
Chemical	22,4	0,0
None	1,3	2,6
TOTAL	**100,0** (n_i=76)	**100,0** (n_d=43)

As Table 7.11 indicates, all the null hypotheses relating to the methods of weed control and annual turnover and source of household food supply at Qamata are accepted. This observation means that there is no association between the methods of weed control and annual turnover and source of household food supply. What this means is that the methods of weed control do not have any impact on annual turnover and the source of household food supply probably because the methods of weed control are ineffective. Competition from weeds for the available soil moisture and nutrients

[81] The researcher obtained this information at a group discussion with irrigation farmers at QIS on 5 September 2005 (Appendix 8, item 23(c)).

significantly affects the volume and quality of yields. It is estimated that competition from weeds accounts for up to 50% of the loss in field production, 50% of total farm labour and 40% of production cost in poor farming communities (Fernandes, 2003:1). The fact that only a small proportion of both irrigation and dryland farmers do not control weeds at all on their holdings (Table 6.40) may mean that the weeds are removed when it is too late to impact positively on crop yields (see Section 4.5.2 of Chapter 4).

Table 7.11 Summary of tests of hypotheses to assess the association between the methods of weed control and annual turnover and main source of household food supply

Category of farmers	Variables	p-value	Decision
Irrigation	Var. 1: Methods of weed control Var. 2: Annual turnover	.299	Accept H_o
	Var. 1: Methods of weed control Var. 2: Source of household food supply	.298	Accept H_o
Dryland	Var. 1: Methods of weed control Var. 2: Annual turnover	.661	Accept H_o
	Var. 1: Methods of weed control Var. 2: Source of household food supply	.505	Accept H_o

According to the results of the independent samples t-tests (Table 7.12), the aspects of methods of production which both the irrigation and dryland farmers have in common are scale of production and methods of weed control. However in the case of weed control, about a fifth of the irrigation farmers employ a modern approach, such as the use of herbicides, to save time and labour. The two groups of farmers differ in terms of (i) fertilizer application where the irrigation farmers largely employ chemical fertilizers and about 20,5% of the dryland farmers use kraal manure; (ii) methods of ploughing where the irrigation farmers perceive mechanization as the appropriate method while 32,6% of the dryland farmers prefer the use of animal draft power to save time and financial resources; and (iii) the control of insects and pests where the irrigation farmers rely on the advice of extension officers and the dryland farmers rely on a variety of sources including their own instinct and advice of retailers and dealers.

The general impression is that the method of ploughing adopted by the irrigation farmers is based on the mode of production once employed on Lanti Farm and they are reluctant to modify their approach even if cheap local substitutes are readily available (see Section 4.5.1 of Chapter 4). This attitude towards mechanization and perception of modern methods of agricultural production in the irrigation farming community has bedevilled agricultural development at Qamata.

Table 7.12 Summary of independent samples t-tests which compare annual turnover and methods of production in irrigation and dryland farming communities at Qamata

Variables	t	p-value	95% Confidence Interval of the Difference		Decision
			Lower	Upper	
Annual turnover	-1.981	.051	-1.24433	.00173	Accept H_o
Scale of production	.929	.355	-.04917	.13596	Accept H_o
Methods of ploughing	-3.980	.000	-.26210	-.08790	Reject H_o
Application of fertilizers	-2.854	.005	-.27793	-.05014	Reject H_o
Methods of weed control	2.781	.006	.11903	.70832	Accept H_o
Control of insects and pest	-2.474	.015	-.21548	-.02387	Reject H_o

Although the irrigation farming community has the essential infrastructure to expand production, the adoption of and reliance on agricultural machinery for essential farming operations and commercial fertilizers limits its capacity to increase production. The cost of production increases sharply as the scale of production expands. In addition shortages of agricultural machinery result in late planting and its disastrous impact on crop yields. The use of exotic resources and materials as opposed to local substitutes increases the cost of farm production and renders irrigation farming unviable and unsustainable, especially for smallholder food crop farmers.

7.7 Soil conservation

The most popular soil conservation method adopted by 77,6% of the irrigation farmers and 81,4% of the dryland farmers who participated in the questionnaire survey is contour ploughing (Figure 7.1). The data contained in Figure 7.1 shows that 14,5% of the irrigation farmers and 9,3% of the dryland farmers do not practice any form of soil conservation. The reason offered by the extension officers for this observation is that because of increased yields resulting from the application of fertilizers (and the availability of water in the case of the irrigation farmers), the farmers concerned are not aware of the problem of sheet erosion on their farmlands; the farmers usually become aware of the problems of soil erosion only when their holdings are damaged and the productive part of the soil is lost.[82] The widespread adoption of soil conservation practices indicates that the greater majority of the farmers are aware of the negative impact of soil erosion on crop production in the area. A visit to the dryland farms in the surrounding villages along the slopes of the mountains indicates that some of the farms are gradually shrinking in size as the adjacent gullies widen.

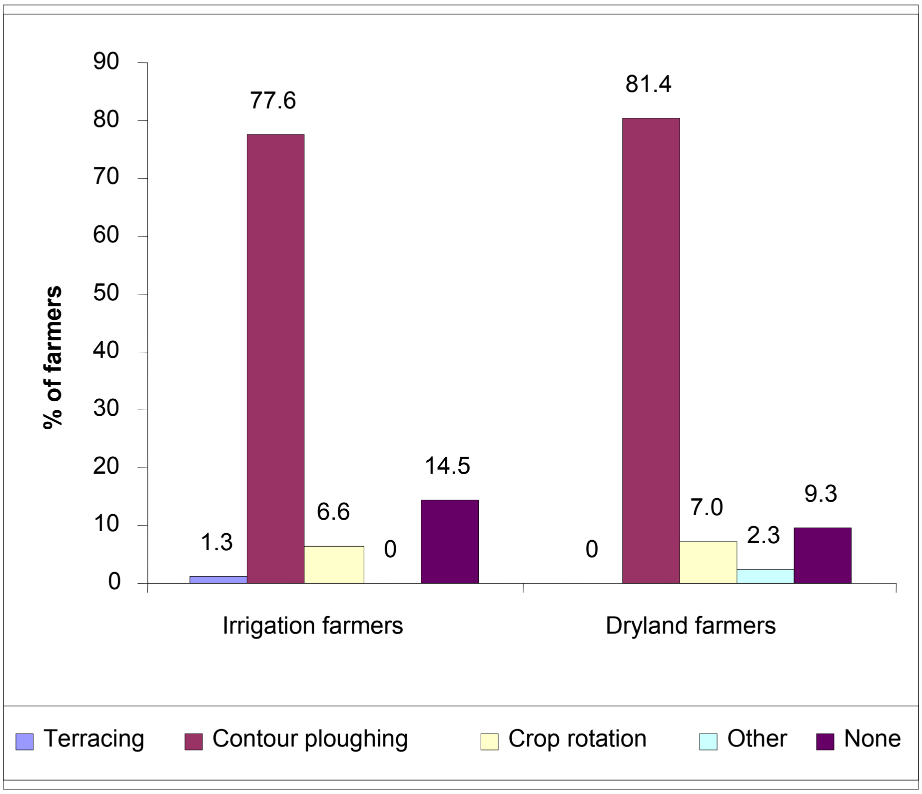

Figure 7.1 Distribution of farmers according to soil conservation practices

Terracing as a soil conservation measure is not employed by dryland farmers because the construction of terraces is tedious, expensive and time-consuming. Instead they adopt additional measures classified as ‘Other’ (Figure 7.1). These soil conservation measures were identified by the

[82] The researcher obtained this information at a group discussion with extension officers at QIS on 2 September 2005 (Appendix 7, item 12).

extension officers as (i) avoiding planting on steep slopes, (ii) increasing plant population on farms, and (iii) decreasing row spacing.[83]

7.8 Extension services

The quality of extension service depends, *inter alia*, on the available infrastructure, training, experience, age and the level of motivation of the agricultural extension officers who interact on a regular basis with the farmers. Eight agricultural extension officers are permanently assigned to the scheme. All the extension officers passed the Standard 10 (matriculation) examination and have had a minimum of two years post-matriculation training in agricultural extension services[84]. According to the provisions of the Norms and Standards for Extension and Advisory Services policy (see Section 2.7 of Chapter 2) the extension officers do not qualify to provide extension services. However, they regularly attend refresher courses and in-service training organised by the Department of Agriculture and Land Affairs. They are familiar with the farming and socio-economic conditions of Qamata because 50,0% of the extension staff are natives of the area. Besides, as much as 71,4% of the extension officers have been working at the scheme for over a period of ten years[85].

Male domination at the scheme is evidenced by a complete absence of female extension workers. All the extension workers are males aged between 30 and 59 years. As indicated in Figure 7.2, 42,8% of the extension workers are aged between 40 and 49 years and less than a third is aged between 50 and 59 years. The age structure suggests that the extension officers possess both the mental and physical vitality required to execute successfully the functions and duties of agricultural extension workers. The extension officers are in charge of the day-to-day management of farming operations at the scheme, and coordinate institutional support services on the ground. They report to the Senior Agricultural Extension Officer at the scheme.

[83] The researcher obtained this information at a group discussion with extension officers at QIS on 2 September 2005 (Appendix 7, item 12).
[84] The researcher obtained this information at a group discussion with extension officers at QIS on 2 September 2005 (Appendix 7, item 14).
[85] The researcher obtained this information at a group discussion with extension officers at QIS on 2 September 2005 (Appendix 7, item 14).

The state of infrastructure, particularly the transport and communication network, and the effectiveness and the quality of extension service are directly related. The provision of good infrastructure is a requirement for establishing a better agricultural extension service which enables farmers to achieve higher levels of production and profitability (see Section 4.4.2 of Chapter 4).

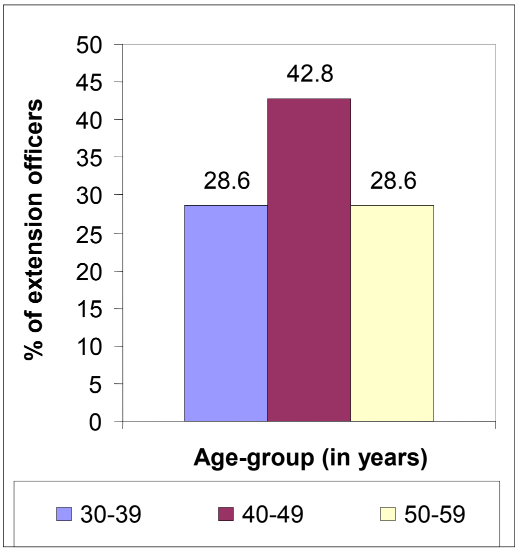

Figure 7.2 Age structure of extension officers at QIS

Inadequate physical infrastructure constitutes a major obstacle to effective extension service and agricultural development at QIS. The extension service provides valuable information and support to the farmers. The extension officers therefore need motor vehicles to contact the farmers and telephones to communicate with research and training institutions, retailers and senior officers and experts at the head office of the Department of Agriculture. At QIS the extension team has no official motor vehicle for visiting the farmers and the roads to the irrigated plots are poorly maintained. Besides, the extension officers rely on their personal mobile phones to communicate with senior officers and experts and to receive invitations to seminars, courses and in-service training. Records are poorly maintained at the scheme. None of the extension officers keep field records of individual farmers, such as records of crop yields and sales.[86] The extension officers blame the poor state of record keeping on agricultural development on the total lack of facilities such as computers. Consequently data recorded in field notebooks are dumped in the poorly furnished offices and are eventually lost. The monthly and quarterly reports therefore give an impression about the general state of agriculture at the scheme and do not indicate progress made by individual farmers or by sections of the scheme.

Not surprisingly, not all farmers at QIS have regular access to the extension service. As noted in Section 2.7 of Chapter 2, the success of top-down transfer of irrigation technology is determined, among other factors, by the effectiveness of extension services backed by sound management policy. Table 7.13 indicates that 59,2% of the irrigation farmers surveyed are visited regularly (at least once in every four weeks, especially during the planting season[87]) by extension officers, 19,7% have access to extension service once in a while and for 19,7%, extension officers hardly visit their holdings. In the dryland farming communities, only 39,5% of the farmers who participated in the survey are visited regularly by extension officers. Table 7.13 reveals a concentration of farmers whose farms are not visited regularly by the extension officers in the lowest two brackets of the total annual turnover of all agricultural activities. The farmers with plots at vantage points secure greater access to extension services than their counterparts in remote locations.

Invariably the perceptions of the farmers with regard to the availability and quality of extension services were mixed. Probably owing to the long association with the extension officers, 62,5% of the irrigation farmers are confident that the extension officers possess adequate knowledge and experience to offer appropriate advice for their agricultural problems and needs; 37,5% even attributed increases in their levels of production to the superior expertise of the extension officers[88].

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[86] The researcher obtained this information at a group discussion with extension officers on 2 September 2005 (Appendix 7, item 14).

[87] The researcher obtained this information at a group discussion with irrigation farmers on 5 and 7 September 2005 (Appendix 7, item 15).

[88] The researcher obtained this information at a group discussion with irrigation farmers on 5 September 2005 (Appendix 8, item 14(a)).

Table 7.13 Cross-tabulation: annual turnover of all agricultural activities and frequency of visits of extension officers

Category of farmers	Frequency of visits of extension officers	Total annual turnover of all farming activities							TOTAL (%)
		R0 - R5000 (%)	R5000 - R9999 (%)	R10000 - R14999 (%)	R15000 - R19999 (%)	R20000 - R24 999 (%)	R25000 - R29 999 (%)	R30000+ (%)	
Irrigation	Regular	24,4	31,2	31,2	2,2	4,4	2,2	4,4	**59,2**
	Once a while	60,0	33,3	6,7	0,0	0,0	0,0	0,0	**19,7**
	Not at all	81,3	18,7	0,0	0,0	0,0	0,0	0,0	**21,1**
	TOTAL (n_i=76)	**43,5**	**28,5**	**20,2**	**1,3**	**2.6**	**1,3**	**2.6**	**100**
Dryland	Regular	52,9	41,2	0,0	0,0	5,9	0,0	0,0	**39,5**
	Once a while	44,0	16,0	24,0	8,0	0,0	4,0	4,0	**58,1**
	Not at all	100,0	0,0	0,0	0,0	0,0	0,0	0,0	**2,3**
	TOTAL (n_d=43)	**48,8**	**25,6**	**14,0**	**4,7**	**2,3**	**2,3**	**2,3**	**100**

The farmers who purchase inputs on the advice of retailers do not have access to regular extension service[89]. This group of farmers, however, have a relatively low level of education and training and are easily persuaded by retailers to purchase whatever inputs the retailers have in stock (Personal communication with Mr. Dingiswayo on 21 May 2005). They are obviously vulnerable and need the assistance of the extension officers. They are mainly subsistence farmers and are neglected by the extension officers whose training "failed to impart an understanding and appreciation of subsistence oriented production" (Van Averbeke *et al*, 1998: 201).

The responses to the frequency of extension officers' visits to the farms and those of annual turnover and the source of household food supply are used in the analysis below. The p-values for the tests of association between the frequency of extension officers' visits and annual turnover and extension services and sources of household food supply for both categories of farmers are greater than significance level (Table 7.14). The null hypotheses are therefore accepted. The interpretation is that there are no associations between the frequency of extension officers' visits and annual turnovers and

[89] The researcher obtained this information at group discussions with irrigation farmers on 5 September 2005 (Appendix 8, item 21) and dryland farmers on 7 September 2005 (Appendix 9, item 20).

source of household food supply. This implies that extension services do not have an impact on farmers' access to cash and household food supply at Qamata. From the results of the chi-square tests (Table 7.14) and the revelation from the cross-tabulation of the frequency of extension officers' visits and annual turnover of agricultural activities (Table 7.13) it may be concluded that extension services at the scheme are either ineffective or underutilized. Surprisingly, 88,2% of the irrigation farmers and 86,0% of the dryland farmers claim to consult extension officers more often on farming problems (Appendix 1, item 76 and Appendix 2, item 74).

Table 7.14 Summary of tests of hypotheses to assess the association between the frequency of visits of extension officers and annual turnover and source of household food supply

Category of farmers	Variables	p-value	Decision
Irrigation	Var. 1: Frequency of visits of extension officers Var. 2: Annual turnover	.111	Accept H_o
	Var. 1: Frequency of visits of extension officers Var. 2: Source of household food supply	.096	Accept H_o
Dryland	Var. 1: Frequency of visits of extension officers Var. 2: Annual turnover	.118	Accept H_o
	Var. 1 Frequency of visits of extension officers Var. 2: Source of household food supply	.099	Accept H_o

7.9 Effects of public policy

Before any intervention policy of substance is instituted, it is always necessary to establish accurately what exactly should be done, who should do it and the interests and capabilities of the community for whom it is intended to benefit (see Section 2.2 of Chapter 2). Such decisions provide the foundation for executing the policy (Cornwell, 2003:26). Although there is no single universally accepted method of policy formulation (Corkery, Land and Bossuyt, 1995:8), policy makers and analysts largely agree that popular participation is essential for the promotion of sustainable development and eradication of poverty (de Beer, 2000b:270). Participation of ensures that the requirements, interests and capabilities of the people needed to make the development process viable and sustainable are considered. For this reason, Chiwela (2004:3) for example, advises that beneficiaries of development efforts should stand shoulder to shoulder with development functionaries in policy formulation, implementation, monitoring and evaluation.

7.9.1 Power relations and participation

As discussed in Chapter 3, under the apartheid system of governance power relations permeated every aspect of social life in the black communities. Within the homelands, the absence of democracy and the wholesale importation of growth pole development paradigm from South Africa in the 1970s and early 1980s meant that the contents of development policies and programmes were determined by political and planning authorities with little or no grassroots participation. In the meantime, as Cohen and Uphoff (1980:23) observed, the United Nations Economic Council was propagating the notion that grassroots participation is an integral part of the rural development process and called for increased grassroots participation in decision-making as the fundamental step towards community development. Instead paternalism was by and large established in the homelands.

The opinions of retired farmers and headmen were sought to shed light on the role of the local community in the development of the Qamata Irrigation Scheme (Appendix 6, items 12-15). The views of the current farmers and traditional leaders were not particularly helpful as at the time the irrigation scheme was established they were not old enough to be included in the planning and decision making processes. All the traditional leaders who participated in the questionnaire survey claimed that the traditional leadership was consulted before the scheme was established. Their responses relating to the nature of consultation (Appendix 4, item 7) are presented in Table 7.15.

Table 7.15 Responses of traditional leaders to the question *'What was the consultation about?'*

Responses	Traditional leaders (%)
To inform the community about government's intention to establish irrigation project in the area	78,6
To discuss what the people really needed to alleviate poverty	14,3
To spell out duties and responsibilities	7,1
To ask for support and cooperation for the irrigation scheme	0,0
TOTAL	**100**

From the majority (78,6%) of the responses to the issue of consultation (Table 7.15), it appears that the traditional leadership was merely informed of the government's intention to establish the irrigation scheme at Qamata and did not have any role to play in the project formulation and planning phases. The two retired irrigation farmers (see Section 6.2.1 of Chapter 6) interviewed knew of the intention of the government to establish the scheme at Qamata because their households' land holdings were earmarked to be part of the scheme. They claim their actual participation at the scheme began when the superintendent of the scheme allocated irrigated plots to them[90]. The decision to establish the scheme was made by the homeland authorities in consultation with the South African government and the Western Thembuland paramountcy (Personal communication, Chief S. E. Matanzima at the Great Place on 21 December 2004) [91]. Nonetheless the majority of the extension officers (71,4%) (Appendix 3 item 25) and the traders (70,0%) (Appendix 5, item 25) who participated in the questionnaire survey believe that those who planned and executed the scheme understood the problems, values and aspirations of the local people at the time. One may probably attribute their response to the fact that the establishment of the scheme has given the extension officers employment and the business men and women a better chance to trade. What one gleans from the above responses is that the decision making authorities assumed that traditional leaders and landowners were the only stakeholders of the irrigation scheme in the community.

No matter how one assesses the issue, it is a truism that paternalism and patronage associated with traditional leadership created and perpetuated passivity in the communities. Passivity militates against collective action for community development and thus reinforces rural poverty and deprivation (see Section 3.7.1 of Chapter 3). Its prevalence at Qamata is manifested by the low proportion of farmers who belong to civil society organizations such as cooperative societies and farmers' associations: 82,9% of the irrigation farmers and 93,0% of the dryland farmers do not belong to any cooperative

[90] The researcher obtained this information from interviews with Mr. N. Mdingi and Mr. M. Hlazo (retired QIS farmers) at St. Marks on 3 September 2005 (Appendix 6, item 15).

[91] Chief S. E. Matanzima's assertion was supported in separate interviews by Mr. N. Mdingi and Mr. M. Hlazo (retired QIS farmers) at St. Marks on 3 September 2005 and Mr. M. G. Daweti (former Project Manager of QIS) and Mr. M. B. Foloti (former TRACOR official at QIS) in Queenstown on 16 September 2005 (Appendix 6, items 3 and 14).

society and farmers' associations (Table 7.16). However, the farmers are aware that information sharing, adoption practices and access to resources and markets can be improved through cooperative societies and farmers' associations[92].

Table 7.16 Cross-tabulation: highest academic qualification and membership of farmer/cooperative organisations

Category of farmers	Highest academic qualification	Do you belong to any agricultural cooperative society?		TOTAL (%)
		Yes (%)	No (%)	
Irrigation	Up to Std 2	21,7	78,3	**30,3**
	Std 3-Std 6	6,7	93,3	**39,5**
	Std 7-Std 9	18,2	81,8	**14,4**
	Std 10	50,0	50,0	**7,9**
	Post matric	16,7	83,3	**7,9**
	TOTAL (n_i=76)	**17,1**	**82,9**	**100**
Dryland	Up to Std 2	0,0	100,0	**18,6**
	Std 3-Std 6	7,7	92,3	**60,4**
	Std 7-Std 9	16,7	83,3	**14,0**
	Std 10	0,0	100,0	**2,3**
	Post matric	0,0	100,0	**4,7**
	TOTAL (n_d=43)	**7,0**	**93,0**	**100**

Burkey (1993:40-47) maintains that participation and partnerships legitimize development processes and make stakeholders self-reliant. Although public policies (e.g. RDP, ISRDP and IDP) since 1994 reflect the holistic, people-centred development approach (Davids, 2005a:19), it appears that the social and political transformation that followed the 1994 general elections was not accompanied by sufficient structural changes in the rural communities to encourage wholesale and uninhibited grassroots participation. Illiteracy and ignorance have been isolated as the crucial factors that account for the widespread inertia towards participation in community development and cooperative societies (IFAD, 2001:201). Indeed the farmers at Qamata

[92] The researcher obtained this information at group discussions with irrigation farmers on 5 September 2005 (Appendix 8, item 3) and dryland farmers on 7 September 2005 (Appendix 9, item 3).

justified their non-participation in cooperative activities in terms of illiteracy and their inability to articulate their views on community and agricultural development issues because they do not know how to access information and knowledge about development programmes, policies and resources.[93]

However, the cross-tabulation of level of education and participation in cooperative societies and farmers' organisation presented in Table 7.16 shows that participation in cooperative societies and farmers' organisations is not a function of education: the farmers with higher levels of education stay out of cooperative societies and farmers' organisations just like those with lower levels of education. The chi square tests for association between levels of education and participation in cooperative societies and farmers organisations give p-values of 0.202 and 0.769 for irrigation and dryland farmers respectively; the null hypotheses are thus accepted meaning that no association exists between the two variables in either case. Certainly illiteracy and ignorance alone cannot explain the farmers' passive attitude towards cooperative societies and farmer organisations at Qamata: there are other reasons.

Firstly, the role of traditional authorities in local government is not clear as the 1996 Constitution provides for elected rural councillors and their juxtaposition with the traditional authorities (*Daily Dispatch*, 14 July 2005: 4; Ntsebeza, 2003: 55-76; 1999:61-64). The two structures compete for hegemony in the rural areas. In order not to antagonize any of the competing parties for fear of reprisals, the farmers stay clear of participating in most community development processes and structures. Secondly, Baron (2003) suggests that the traditional leadership perceives the idea of unrestrained participation as a threat to its influence and probably to its existence. Hence, community participation, at best, is a spurious gesture. Both past and contemporary public policies with respect to traditional leadership are thus blamed for the farmers' passivity at Qamata.

[93] The researcher obtained this information at group discussions with irrigation farmers on 5 September 2005 (Appendix 8, item 4) and dryland farmers on 7 September 2005 (Appendix 9, item 4).

7.9.2 State assistance and institutional services

Smallholder irrigation schemes depend heavily on infrastructure and physical capital to function properly. Besides, they require subsidized inputs and institutional services (e.g. extension services and credit and marketing facilities) to thrive. At Qamata Irrigation Scheme, the physical capital is provided by Department of Water Affairs and Forestry, ESKOM and Chris Hani District Municipality (see Section 4.3.7 of Chapter 4). The government departments and institutions which assist farmers at QIS identified by the irrigation farmers (Appendix 1, item 86), dryland farmers (Appendix 2, item 84), extension staff (Appendix 3, item 8) and traditional leaders (Appendix 4, item 27) are given in Table 7.17.

Table 7.17 Distribution of irrigation and dryland farmers, extension officers and traditional leaders according to their perception of government departments/institutions that assist farmers at Qamata

Departments/institutions	**Irrigation farmers (%)**	**Dryland farmers (%)**	**Extension officers (%)**	**Traditional leaders (%)**
Dept of Agriculture/Land Affairs/Dept of Water Affairs and Forestry	84,2	72,1	85,7	57,1
Chris Hani District Municipality/Dept of Agriculture	9,2	5,0	14,3	35,7
Chris Hani District Municipality/Eastern Cape Development Corporation	5,3	14,0	0,0	7,2
Other	1,3	9,3	0,0	0,0
TOTAL	**100** (n_i=76)	**100** (n_d=43)	**100** (n_e=7)	**100** (n_t=14)

The three government departments/institutions that assist irrigation farmers which were identified by the majority of the respondents are Department of Agriculture, Department of Land Affairs and Department of Water Affairs and Forestry. As noted in Section 2.6 of Chapter 2, the Department of Agriculture is legally obliged to provide institutional support for the development of smallholder irrigation. In the dryland farming communities, 72,1% of the farmers identified the same government departments and institutions as assisting the farmers (Appendix 2, item 84). The assistance ranges from physical infrastructure to extension service, subsidized inputs and credit and marketing facilities.

The importance of state assistance to the irrigation farmers is revealed by the results of the chi square tests presented in Table 7.18. The null hypothesis is rejected in each case of the test of association between annual turnover and the types of state assistance suggesting that association exists between the two variables. One can argue that the types of state assistance available at QIS improve the farmers' access to cash because their productivity is augmented by the assistance as discussed in Section 4.4.3 of Chapter 4: more surplus produce is available for sale. Given the right type of state assistance such as the infrastructure to adopt biotechnology as discussed in Section 2.4 of Chapter 2, the irrigation farmers can improve their access to cash. Therefore farmers' access to cash is directly influenced by public policy which regulates the availability and variety of state support at QIS.

However the p-values for the tests of association between source of household food supply and types of state assistance and state withdrawal indicate that no association exists between the variables (Table 7.18). The observations are interpreted to mean that firstly, the types of state assistance available at QIS do not bring down cost of production. Hence an increase in production resulting from the availability of state assistance does not affect the source of household food supply as it is sold to defray production cost.

Table 7.18 Summary of tests of hypotheses to assess the association between state assistance and annual turnover of the farmers at Qamata.

Category of farmers	Variables	p-value	Decision
Irrigation	Var. 1: Types of state assistance Var. 2: Annual turnover	.001	Reject H_o
	Var. 1: State withdrawal Var. 2: Annual turnover	.027	Reject H_o
	Var. 1: Types of state assistance Var. 2: Source of household food supply	.319	Accept H_o
	Var. 1: State withdrawal Var. 2: Source of household food supply	.569	Accept H_o
Dryland	Var. 1: Types of state assistance Var. 2: Annual turnover	.135	Accept H_o

One is thus inclined to believe that the state assistance to the farmers is inappropriate to render farming at QIS sustainable. Secondly, the withdrawal of state assistance does not affect household food supply; probably the types of state support available at QIS benefit the commercial farmers to improve their annual turnover and not the subsistence food crop farmers. The test for association between types of state assistance and annual turnover for the dryland farmers shows that no association exists between the variables (Table 7.18). The supply of state assistance to the dryland farmers may be unreliable or inappropriate since the dryland farmers are not organised and unlike their irrigation counterparts they are not represented by any management committee. The cross-tabulation of gender of farmers and the types of state assistance available at QIS indicates that access of females to state assistance is restricted (Table 7.19).

Figure 7.19 Cross-tabulation: gender and type of state assistance to the irrigation farmers

Type of assistance	**Gender of irrigation farmers**		**TOTAL**
	Males (%)	**Females (%)**	
Credit facilities	83,3	16,7	7,9
Inputs (e.g. fertilizers)	60.0	40,0	26,3
Advice and extension service	61,7	38,3	61,9
Marketing	100,0	0,0	1,3
None	50,0	50,0	2,6
TOTAL (n_i=76)	**56,6**	**43,4**	7,9

7.9.3 Capacity building

As noted in Section 2.6 of Chapter 2, the 1995 White Paper on Agriculture (DoA, 1995) acknowledges that the lack of technical knowledge of agricultural production and training prevent smallholder irrigators from becoming self-sufficient; for example, they cannot undertake routine maintenance and repair of equipment. Capacity building is an important component of irrigation technology transfer because it augments farmers' capacity to produce, process and market produce, use credit and keep proper records of farm transactions to ensure sustainability of farm operations. Training is the most important aspect of capacity building (Chancellor and O'Neil, 1999:19). The training of farmers in agricultural and management techniques prepares the irrigators for the eventual withdrawal of government support (see Sections 2.9.2 and 2.11 of Chapter 2). The following subsections analyze the acquisition of farming and entrepreneurial skills at QIS.

7.9.3.1 Farming skills

The responses to the following items from the questionnaires for the irrigation farmers (Appendix 1) were used in the analysis:

(i) Trade skill(s)/profession (Appendix 1, item 8).

(ii) From whom did you learn your faming skills? (Appendix 1, item 73).

(iii) Does the lack of skills/experience ever limit your farm operations and production? (Appendix 1, item 77).

(iv) What type of assistance do you receive from state institutions/government departments? (Appendix 1, item 88).

From the analysis of the responses to trade skill(s)/profession, it is evident that none of the irrigation farmers is a professionally qualified farmer. There is therefore a need to train them especially in the art of irrigation farming because irrigation does not form part of traditional farming system and the farmers are likely to lack the essential skills. The irrigation development policy, however, did not define a formal way of training farmers at the scheme. Lanti was the experimental farm for the generation of innovative farming ideas and processes for the local farmers and not for training the irrigation farmers (Xhosa Development Corporation, 1967:99). New and innovative ideas were simply passed on to the farmers via the extension officers. Training in the techniques of farming has not been formally instituted at QIS. It is not surprising that 85,5% of the irrigation farmers regard the lack of farming skill(s) and experience as the most significant factor that limits their farming operations and production. The source of farming skills of 71,1% of the farmers is the extension service (Appendix 1, item 73). The lack of training at QIS is also manifested in the responses of the irrigation farmers to the type of assistance they receive from state institutions and government departments (Table 7.19). The implication is that farmers cannot effectively employ the facilities at their disposal to increase production to escape poverty and achieve food security.

7.9.3.2 Development of entrepreneurial skills

Records of farm transactions are important because they provide the basis for estimating investment needs and expected returns (Personal communication, Mr. Dhlangisa at QIS on 8 April 2008). Farm records are therefore essential for planning agricultural operations and investments. The statistical tests performed in this section seek to establish the extent to which the entrepreneurial skills of the irrigation farmers have developed by comparing bookkeeping records and annual turnover, credit and loans and academic qualification. The aim is to establish whether the farmers are able to manage their farms effectively to ensure sustainability of their operations. The pairs of variables tested for associations in verification of the contentions of the supposition are presented in Table 7.20 below.

The p-value of the test of association between record keeping and academic qualification is 0.067, higher than the level of significance of 0.05. The null hypothesis which states that no association exists between the two variables is thus accepted (Table 7.20). The level of education of the irrigation farmers is too low to have any positive impact on record keeping. Although the level of education at QIS is higher than in the dryland farming communities (see Section 6.2.5 of Chapter 6), the level of education of the smallholder irrigation farmers does not meet the demands of irrigation farming, especially accurate record keeping of transactions. This assertion reinforces an earlier observation (see Section 6.2.5 of Chapter 6) that the influence of education of the irrigation farmers on the socio-economic development of the Qamata area is limited. The high degree of association between record keeping skills and sources of record keeping skills (evident in Table 7.20) means that if there were organised training centres and facilities locally many farmers would have acquired bookkeeping and other essential vocational and entrepreneurial skills such as marketing needed to make the local economy viable and sustainable. Indeed the withdrawal of government support after 1994 adversely affected 59,2% of the irrigation farmers as they found it difficult to sell their produce (Appendix 1, item 104). The current sources of vocational training are too inadequate to offer the majority of the farmers the required level of training in record keeping because as much as 86,8% of the farmers have never had any record keeping training (Appendix 1, item 110). The development of entrepreneurial and managerial skills among the smallholder irrigators at QIS is consequently hampered. Therefore, the irrigation farmers cannot participate effectively in the management of the scheme.

Table 7.20 Summary of tests of hypotheses to assess the association between development of entrepreneurial skills, loan/credit and indicators of welfare at QIS

Variables	p-value	Decision
Var. 1: Record keeping Var. 2: Academic qualification	.067	Accept H_o
Var. 1: Record keeping Var. 2: Source of record keeping skills	.001	Reject H_o
Var. 1: Type of loan/credit Var. 2: Record keeping	.001	Reject H_o
Var. 1: Record keeping Var. 2: Annual turnover	.161	Accept H_o
Var. 1: Record keeping Var. 2: Sources of household food supply	.681	Accept H_o

The types of loan and credit the irrigation farmers solicit is directly related to record keeping skills. The p-value of the test for association between record keeping and type of loan and credit solicited is 0,001 which calls for the acceptance of the null hypothesis. The majority (51,3%) of the irrigation farmers do not apply for loans and credit. The farmers' attitude towards loans and credit is conditioned by their fear of risks associated with loans and credit[94]. As already discussed in this section, the farmers' access to cash is generally limited. The implication is that without loans and credit the farmers cannot expand their operations and invest in other off farm economic ventures. The lack of entrepreneurial skills has severe consequences on source of household food supply and annual turnover as the tests results presented in Table 7.20 show that there are no associations between record keeping and the variables.

7.10 Social performance

The effects of irrigation schemes on the health, social systems and cultures of the people are an integral part of their performance records. However, the direct benefits of these public infrastructure projects, manifestly aimed at the socio-economic development of communities, are hardly recorded in human terms. Instead the benefits are reduced to monetary figures for economic analyses and the full social benefits which cannot be quantified in monetary terms are largely ignored (The World Commission on Dams, 2000:97). The

[94] The researcher obtained this information at group discussions with irrigation farmers on 5 September 2005 (Appendix 8, item 25) and dryland farmers on 7 September 2005 (Appendix 9, item 24).

social benefits are equally important because they create the social environments which facilitate the attainment of the economic objectives of the public infrastructure projects. Attempts are made in this section to outline the social impacts of QIS from the perspective of social relations.

A number of chi-square tests are performed to establish whether associations between some selected key variables exist. The results of the tests and the pairs of variables used for the analyses are presented in the tables in the sections below. The aim is to demonstrate the impacts of prevailing social conditions (e.g. health, housing, unemployment and rural-urban migration) on agricultural development and production at QIS.

7.10.1 Health

The responses to condition of health, annual turnover and sources of household food supply are used in the analyses in this section. The response of the irrigation farmers to how they perceive their conditions of health are given in Table 7.21. The health conditions of the majority of the irrigation farmers are a source of concern as less than a third of them can describe their health conditions as excellent and good. The cross-tabulation of the conditions of health and the age structure of the farmers (Table 7.21) offers an explanation for the above observation. The farmers who describe their conditions of health as fair and poor are mostly aged over 50 years. Age thus presents a formidable challenge to agriculture and irrigation development at Qamata.

Table 7.21 Cross-tabulation: condition of health and age structure of irrigation farmers

Age group	Condition of health				TOTAL
	Excellent (%)	**Good (%)**	**Fair (%)**	**Poor (%)**	
20-29 years	0,0	100,0	0,0	0,0	1,3
30-39 years	0,0	100	0,0	0,0	2,6
40-49 years	15,8	73,7	10,5	0,0	25,0
50-59 years	0,0	23.3	76,7	0,0	39,5
60+ years	0,0	25,0	50,0	25,0	31,6
TOTAL (n_i=76)	**3,9**	**26,3**	**48,7**	**21,1**	**100**

The p-value of the test of association between the condition of health and annual turnover of irrigation farmers indicates a high degree of association between the two variables at 0.05 level of significance (Table 7.22).

Table 7.22 Summary of tests of hypotheses to assess the association between condition of health, annual turnover of agricultural activities and the main source of household food supply at QIS

Variables	p-value	Decision
Var. 1: Annual turnover Var. 2: Condition of health	.001	Reject H_o
Var. 1: Source of household food supply Var. 2: Condition of health	.305	Accept H_o

The low annual turnover of agricultural activities is directly linked to the poor health of farmers. From the analysis of the food and nutrition situation at QIS (see Section 6.4.6 of Chapter 6), it is highly probable that the principal causes of the prevailing poor health conditions among the aged farmers may include malnutrition (Figure 6.8). The lack of association between the source of household food supply and the condition of health of the farmers (Table 7.22) gives credence to this assertion. The source of household food supply is unreliable and does not have a positive impact on the health of the farmers and their households as most of the households purchase their food requirements; but access to cash is low. This means that most of the irrigation farmers cannot afford an adequate quantity and quality of food required to maintain good health.

7.10.2 Education

The responses to the highest academic qualification, annual turnover of all agricultural activities and the main source of household food supply are used in the analysis that follows. The annual turnover of all agricultural activities is not related to the highest academic qualification of the irrigation farmers. The p-value of the test of association between the two variables is 0.341 which is larger than the significant level of 0.05 thus indicating that no association exists between the two variables (Table 7.23). Both the highest academic qualification of the irrigation farmers and their annual turnover of all agricultural activities at QIS are low generally; the low level of education and low annual turnovers are mutually reinforcing. The low literacy rate prevents farmers from accessing valuable information to optimally combine the available resources to increase productivity. The p-value (.096) of the test of association between the highest academic qualification of the farmers and the main source of household food supply shows that no association exists between the two variables. On the average the highest academic qualification of the farmers is so low that it does not have any significant influence on annual turnover of all agricultural activities and the main source of household food supply.

Table 7.23 Summary of tests of hypotheses to assess the association between the highest academic qualification, annual turnover of agricultural activities and the main source of household food supply at QIS

Variables	**p-value**	**Decision**
Var. 1: Annual turnover Var. 2: Highest academic qualification	.341	Accept H_o
Var. 1: Sources of household food supply Var. 2: Highest academic qualification	.096	Accept H_o

In the second half of the 1980s, the management of the scheme realised the inadequacies of the farmers as the result of low level of education. Hence, an adult basic education and literacy project was established with the assistance of the Department of Education of the former Transkei at the scheme to improve literacy and numeracy levels of the farmers. However, as the financial woes of the scheme mounted, the project was scrapped soon after commencement (Personal communication, Mr. M. Sodinda, the Liaison Officer, Qamata Special Projects on 2 September 2005 at Qamatapoort).

7.10.3 Housing

The responses to the type of housing, the number of people in the household, the number of rooms used for sleeping purposes, annual turnover of agricultural activities and conditions of health are used for the analysis to ascertain the influence of the scheme on housing. The outcome of the tests of hypotheses presented in Table 7.24 shows that no association exist between type of housing and annual turnover of irrigation farmers as the p-value of

0.077 is greater than the significant level of 0.05. Owing to the high cost of production the earnings from farm operations are too low to have any appreciable impact on housing. It appears there is stagnation in agricultural production. The gravity of the situation is best grasped when the association between annual turnover and the number of people in the household is considered. No association exists between the annual turnover of agricultural activities and the number of people in the household: an increase in household population does not bring about an increase in annual turnover of agricultural activities to improve access to cash to provide adequate accommodation.

Table 7.24 Summary of tests of hypotheses to assess the association between type of housing, annual turnover of agricultural activities, number of people in the household, the number of rooms used for sleeping purposes and condition of health at QIS

Variables	p-value	Decision
Var. 1: Type of housing Var. 2: Annual turnover	.077	Accept H_o
Var. 1: Annual turnover Var. 2: Number of people in the household	.065	Accept H_o
Var. 1: Number of rooms used for sleeping Var. 2: Condition of health	.027	Reject H_o

Table 7.25 indicates that 34,2% of the households live in overcrowded housing conditions at QIS. In this study a household is regarded as overcrowded when five or more people use a room or hut for sleeping purposes[95]. The p-value of the test of association between the number of rooms used for sleeping purposes and condition of health of the farmers is 0.027. The observation is interpreted to mean that association exists between the two variables: as the number of people who sleep in a room increases the proportion of the farmers with poor health increases (the ‘Poor’ column of Table 7.25). Overcrowded conditions are ideal for the spread of respiratory diseases such as tuberculosis. Not surprisingly, 16,5% of the households identified tuberculosis as one of the most common diseases prevailing in their communities (Appendix 1, item 41).

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[95] Asiama (1990:566) suggests that, in Ghana, overcrowding occurs when there are 2.5 or more people per room. If this criterion is applied to the situation at QIS, then, over 60% of the households at are overcrowded.

Table 7.25 Cross-tabulation: condition of health and the number of rooms used for sleeping purposes

Number of rooms used for sleeping purposes	Condition of health				TOTAL (%)
	Excellent (%)	Good (%)	Fair (%)	Poor (%)	
1	5,3	42,1	52,6	0,0	**5,3**
2	4,3	34,8	60,9	0,0	**10,3**
3	5,6	50,0	38,8	5,6	**24,0**
4	0,0	38,5	46,2	15,3	**27,3**
5+	0,0	0.0	0,0	100,0	**34,2**
TOTAL (n_i=76)	**3,9**	**26,3**	**48,7**	**21,1**	**100**

7.10.4 Unemployment

Unemployment is a serious problem at QIS: 59,2% of the irrigation farmers have at least three unemployed household members (Appendix 1, item 19). Irrigation farming at Qamata does not generate enough job opportunities because of the subsistence nature of farming, lack of entrepreneurial skills limiting investment in both farm and non-farm economic ventures as well as the lack of credit facilities to expand production.

The p-values of the tests of associations between annual turnover, main source of household food supply and the percentage of unemployed adults in the households do not suggest the existence of an association between each of the pairs of variables indicated in Table 7.26. The lack of association between the annual turnover of agricultural activities, the main source of household food supply and the proportion of unemployed adults in the household at QIS is structural. Unemployment is structural because it is primarily linked to traditions, culture and the system and mode of production (see Chapter 3). Structural changes are therefore needed to alleviate the problems of unemployment in the community.

Table 7.26 Summary of tests of hypotheses to assess the association between the annual turnover of all agricultural activities, percentage of unemployed adults and the main source of household food supply at QIS

Variables	p-value	Decision
Var. 1: Annual turnover Var. 2: % of unemployed adults in the household	.215	Accept H_o
Var. 1: Source of household food supply Var. 2: % of unemployed adults in the household	.202	Accept H_o

The lack of association between the two pairs of variables (Table 7.26) further suggests that unemployed people do not participate in farming activities, although there is a shortage of farm labour, and do not therefore contribute towards the annual turnover of agricultural activities and the household food supply. Unemployment thus constitutes a problem in the community as it exerts considerable pressure on the meagre output of the households, thereby limiting the opportunities and chances of a better and tolerable life.

7.10.5 Rural-urban migration

The responses used for the analysis of rural-urban migration at Qamata are given in Table 7.27. The choice of the variables was guided by the need to demonstrate the effects of rural-urban migration on the local economy in spite of the irrigation scheme. The annual turnover of all agricultural activities is used to gauge the effects of rural-urban migration on farm labour. One of the manifestations of rural-urban migration is the shortage of farm labour as the youth usually leaves the rural areas. The shortage of farm labour is reflected in reduced output because essential farm operations cannot be performed: reduced output is in turn reflected in low annual returns of agricultural activities and reduced access to food; and reduced access to food eventually results in poor health conditions of the farmers.

Table 7.27 Summary of tests of hypotheses to assess the association between out-migration and indicators of welfare and health conditions at QIS

Variables	p-value	Decision
Var. 1: Annual turnover Var. 2: Number of household members working outside	.556	Accept H_o
Var. 1: Main source of household food supply Var. 2: Number of household members working outside	.152	Accept H_o
Var. 1: Condition of health Var. 2: Number of household members working outside	.320	Accept H_o

Table 7.27 depicts no associations between the number of household members working outside Qamata and annual turnover, the main source of household food supply and condition of health of farmers. This means that no causal relationship exists between the number of household members working outside Qamata and the other variables; for example, a change in the number of household members working outside Qamata does not directly or

indirectly lead to a change in the annual turnover of agricultural activities (Rempel, 1978:336; Rakolojane, 2000:26). Probably the local circular labour movement at Qamata (see Section 6.4.7 of Chapter 6) provides the farmers with the required farm labour so that agricultural production is not so adversely affected.

7.11 Summary

Some salient aspects of the findings have been carefully selected and analyzed statistically. The selection and subsequent analyses were performed with a view to verifying the contentions of the hypotheses of the study. The impact of the transfer of irrigation technology to the farming community at Qamata and the role of public policy in achieving the intended objectives of the programme were laid bare. It is appropriate to conclude this chapter by highlighting some of the important outcomes of the analyses.

(i) The idea and policy to establish the Qamata Irrigation Scheme were imposed by the political authorities of the former Transkei aided by the Emigrant Thembuland Tribal Authority whose paramount chief was the then Chief Minister of the territory. Even under the current democratic political dispensation, the farmers are still excluded from decision-making processes at the scheme because contemporary development policies do not really build the capacity of the farmers to take charge of their development.

(ii) Although QIS has made some valuable and incalculable contributions to the social economy of Qamata, the scheme is unsustainable due to inadequate institutional support and services and structural problems such as illiteracy and shortage of skilled personnel and endemic poverty. Hence, poverty, food insecurity and unemployment persist and out-migration of people, especially the youth from the area, continues at full strength and intensity.

(iii) The scheme has failed to address the question of inadequate skills among the local population to successfully manage their farm holdings profitably, with a view to taking over the entire management of the scheme. Besides poverty and food insecurity continue to afflict the local community unabated.

(iv) Some of the methods of production which accompanied the transfer of irrigation technology to Qamata are inappropriate as they do not make full use of available local resources.

In the chapter that follows, the shortcomings of the irrigation development and management policies that have contributed to the performance of Qamata Irrigation Scheme are critically analysed.

CHAPTER 8

POLICY IMPLICATIONS OF THE PERFORMANCE OF QAMATA IRRIGATION SCHEME

8.1 Introduction

The primary objective of Qamata Irrigation Scheme was to develop agriculture at Qamata to provide the basis for alleviating the problems of poverty, unemployment, outmigration and food insecurity (see Section 4.3 of Chapter 4). It implies that the planning authorities assumed that the irrigators cultivating their irrigated holdings could achieve household food security and generate some income to reduce poverty. The assumptions, rules, regulations, processes, institutions and arrangements that the planners and politicians established to guide the irrigation development process to accomplish the stated objectives constituted the irrigation development policy of the Qamata Irrigation Scheme. The first official irrigation development policy (Plan Report Volume 1) for QIS was published by the Xhosa Development Corporation in 1967. A revised policy (Qamata Development Plan) was introduced in 1988 by TRACOR. The Qamata Development Plan reaffirmed the objectives of QIS and entrenched the tenurial arrangements at the scheme as contained in the Plan Report Volume 1 of 1967.

Some commentators blame the inability of the irrigation schemes in the former Bantustans to attain their intended objectives on the inherent weaknesses of the provisions of the respective irrigation development policies (Denison and Manona, 2007:57). This chapter seeks to account for the performance of Qamata Irrigation Scheme as emerged from the analyses of the research findings (discussed in Chapters 6 and 7) in terms of the irrigation development and management policies which guided its development and operations.

8.2 Conflicting policy objectives

The policy objectives of QIS, expressed in terms of 'poverty alleviation', 'employment creation' and 'food security', are vague and misleading because they "create confusion and potential conflict at planning and implementation stages" of irrigation development (Denison and Manona, 2007:57). The objectives were not aligned with realistic economic outcomes premised on likely crop production cost and returns (see Sections 2.5.1 of Chapter 2 and 4.3 of Chapter 4). Although the primary focus of the policy objectives were social, the managing agents were obliged by the policy to pursue economic objectives by operating Lanti Farm to generate profits to support the smallholder irrigation farmers at Qamata. The production of food crops for the purpose of achieving household food security undermined the farmers' ability to pay for the services, supplies and inputs. As discussed in Section 4.3.2 of Chapter 4, the irrigation development policy at Qamata demanded that the farmers pay for the services and inputs they received. When TRACOR took over the management of the scheme in 1986, it encouraged the farmers to make profits in order to pay back production costs and services. However the crops and production patterns remained the same as food security continued to be a major policy objective (Perret, 2001:5). The economic problems mounted as the ageing infrastructure at QIS had to be rehabilitated. The objectives of the development policy of QIS have been the sources of the scheme's financial woes since its inception. It is therefore true to argue that the ambitious objectives of QIS have rendered the irrigation scheme unsustainable in terms of its ability to cover its operation and maintenance costs.

8.3 Allocation of irrigated holdings and tenurial arrangements

The provisions of the policy on the allocation of irrigated plots at the scheme have contributed to the poor performance of QIS. No specific criteria were used as the basis for land allocation besides the applicant being a male and a native of the area and/or might have lost access to land which became a part of the scheme. The irrigated plots largely remain within the possession of the households indefinitely. On the death of a plot holder, the possession passes to a close relative (Lahiff, 1999:26). The criteria for selection of settlers therefore did not ensure that capable farmers were initially settled at the scheme to create a culture of serious farming. The provision for the expropriation of abandoned allotments and those of incompetent farmers was enforced in the early 1980s by Inter-Science (Pty) Ltd. The provision has since not been implemented (Personal communication, Mr. Dingiswayo at QIS on 27 May 2005). This partly explains why nearly 40% of the irrigated allotments have not been cultivated for many years (see Section 4.3.1 of Chapter 4).

8.3.1 Effects on scale of agricultural production

The sizes of the allotments account for the subsistence character of farming at the scheme (Tables 6.3 and 6.7). Each farmer, representing a household, was allocated a piece of irrigated plot whose size ranged between 0,25ha to 2,5ha for food crop farmers and between 2,5ha and 5ha for commercial farmers. However each of the local chiefs and headmen was allocated 6ha of irrigated plot at the scheme (Southall, 1983:227). The holdings designated as commercial farms are too small to render farming a viable and sustainable venture. The allotments for the food crop farmers cannot ensure food security of their households. The plotholders are thus forced to engage in other activities to complement what is generated from irrigation farming (see Section 6.3 of Chapter 6). Agriculture cannot therefore develop beyond subsistence. Unless the size of allotments is increased substantially to generate farm incomes that compare favourably with incomes from other activities, the farmers cannot make full use of the infrastructure and services available at the scheme.

Some aspects of the irrigation development policy at Qamata in the past have been self-defeating: women were denied access to irrigated plots although food crop production has long been the responsibility of adult females in the household (Chancellor *et al*, 1999:1; Van Averbeke, 1998:32). Hence male domination of QIS, noted in Section 6.2.1 of Chapter 6, perhaps accounts for the fact that most households at the scheme encounter problems of food insecurity.

8.3.2 Effects on agricultural development

The tenurial arrangement restricts agricultural development at the scheme. Because land is communally owned (Perret, 2001:4) the irrigated plot allotted to a farmer can be taken away at any time. It implies that if a farmer loses interests in farming the farmer cannot sell the allotment to another farmer who wishes to expand production because land is not privately owned. A farmer who loses interest in farming abandons the allotment. The apparent lack of security of tenure does not offer incentives for investment in land improvement. Vaughan (1997:8) argues that in the irrigation schemes in the former Transkei tenure insecurity results in unsustainable farming practices such as subsistence farming; such farming practices also result in soil erosion which causes the canals to collapse (see Section 4.3.6 of Chapter 4).

8.3.3 Distribution of annual turnover of irrigation farming

Irrigation involves a lot of labour and effort. It is important that the returns (incomes) are distributed fairly amongst the farmers because sustainability of the scheme also depends on the motivation and satisfaction of the farmers with their earnings (Matshalaga, 1999:20). The dissatisfaction of farmers with their earnings at farm level is likely to affect productivity at scheme level. The irrigation development policy at QIS created inequality among the irrigators through the allocation of irrigated plots (see Section 7.2 of Chapter 7). Table 7.1 in Chapter 7 shows that a greater proportion of the subsistence farmers are concentrated in the lowest three categories of the total annual turnover of agricultural activities. The diversification of agricultural activities of the subsistence farmers at QIS to include homestead gardens (see Section 6.3.2 of Chapter 6) may not only be a risk mitigation strategy but also a manifestation of their dissatisfaction with inequalities in the distribution of earnings from irrigation farming.

Inequality also exists between annual turnover of irrigation farmers and that of dryland farmers. A reference to Table 7.1 in Chapter 7 indicates that the farmers whose annual turnovers exceed R1500,00 are irrigation farmers. The transfer of irrigation technology has thus created and maintained socio-economic inequality and dependency at Qamata. Real development lessens inequality in incomes and assets distribution (Seers, 1977:3). It appears the Qamata Irrigation Scheme violates most of the basic principles of irrigation technology transfer discussed in Section 2.7 of Chapter 2.

8.3.4 Age of farmers and the future of QIS

The irrigation policy at Qamata has failed to attract young people to take to farming at the scheme. Almost a third of the irrigation farmers are aged 60 years or more (Figure 6.1). According to Van Averbeke *et al* (1998:114) the average age of household heads of irrigation farmers in the Eastern Cape is 61 years. It thus appears that generally in the province land allocation and tenure arrangements permit plot holders to possess their allotments indefinitely. With the passage of time, the scheme is likely to be dominated by aged farmers who lack the physical vitality to pursue large-scale farming or pioneer agricultural development at QIS. If the land allocation and tenure policies are not reviewed, the scheme will soon be in the firm grip of poverty and household food insecurity because the aged has no incentive and the physical vitality either to increase production or undertake large-scale farming.

8.4 Skills development

Skills development is an important element in the transfer of irrigation technology at Qamata because irrigation farming and the accompanying techniques of production are exotic to the local community (Denison and Manona, 2007:7). The basic skills required to ensure the success of irrigation development are generally lacking (see Section 7.9.3 of Chapter 7). Crop production and entrepreneurial skills are among the skills that are needed to build the capacity of the irrigation farmers to render them self-reliant, and this could be achieved through formal structures such as training centres with facilities and instructors. It is thus surprising that the planners did not institute any formal structures to impart the essential skills to the community of irrigators. Instead, informal training through extension service was advocated. The extension workers have limited technical expertise, especially in the field of entrepreneurial development. Therefore, the institutional arrangements and support at QIS are not adequate to impart the necessary irrigation technology skills to the farmers. The farmers cannot repair basic machinery such as tractors, water pumps or valves[96]. The dearth of entrepreneurial,

[96] The researcher obtained this information at a group discussion with extension officers at QIS on 2 September 2005 (Appendix 7, item 15).

organisational and technical skills brought production at QIS to a complete halt when TRACOR withdrew: the farmers could not solicit credit to finance their operations and also markets for their produce.

8.5 Principles of engagement

It is always necessary to engage stakeholders to set the stage for successful outcomes. The key to achieving success include *inter alia* respect, consultation, participation, community ownership and knowledge sharing. For example, local knowledge is critical for the planning and successful implementation of irrigation technology transfer project (Denison and Manona, 2007:15). It is important that the stakeholders understand the complexity of irrigation technology transfer so that the implications of their decisions can be fully appreciated in order to eliminate passivity. As discussed in Section 7.9.1 of Chapter 7, the traditional leaders and landowners at Qamata were the target of consultation during the planning stage of QIS while the farmers, the ultimate beneficiaries of the programme, were relegated to the background, ignorant of the processes which were unfolding. The apparent lack of community initiative and support impacted negatively on the irrigation technology transfer programme at Qamata as the passivity that ensued discouraged collective action for the development.

8.6 Management of QIS

The management styles of Inter-Science (Pty) Ltd and TRACOR excluded the farmers from decision making processes (Van Averbeke *et al*, 1998:26; ARDRI, 1996:19). The processes of planning and decision making were shrouded in secrecy by Inter-Science and TRACOR although the farmers bore the brunt of the impact of the policies and decisions (see Section 4.3.3 of Chapter 4). The creation of the Management and Consultative Committees did not offer the farmers adequate representation as the farmers were not regarded as partners in the processes of development and transfer of irrigation technology to the community. The management policies and practices did not reflect the skills and production needs of the farmers because the complaints of the farmers in relation to deficiency in the water supply system and inadequate access to tractors, credit and marketing facilities in the early 1990s were largely ignored (ARDRI, 1996:19). The resentment of the farmers and workers that ensued did not only affect production at the scheme but also the transfer of skills and expertise to the farmers.

The policies and practices of the scheme's management before 1994 hardly offered any chance to groom the local community and prepare the farmers to eventually assume full control and management of QIS. What is surprising about Inter-Science (Pty) Ltd and TRACOR's approach to the management of QIS is that since the 1970s, the World Bank had been propagating the concept of participatory irrigation management (PIM) to improve the management and performance of state sponsored smallholder irrigation schemes. PIM ensures that "management decisions … are the outcome of local negotiations between stakeholders and based on local knowledge and normative frameworks" (van Vuren, Papin and El-Haouari, 2004:1). The QIS management policies in effect did not lay the foundation for irrigation management transfer (IMT).

The relative peace at QIS (ARDRI, 1996:19) dissipated after 1994 with competing interests groups, Qamata Trust and Gcaleka Trust competing for hegemony and the control and management of the scheme (see Section 4.3.3 of Chapter 4). It appears there were no effective interim policies to guide the management of QIS; for example, there was no separation between the Qamata Trust and the Water Users Association as the same group of people served in the two institutions. The apparent confusion turned investors away from the scheme (Denison and Manona, 2007:46). The Producers Assembly which has replaced the Qamata Trust as the scheme's management organisation is now responsible for infrastructure and administration of the scheme and the Water Users' Association represents the interests of water users at QIS.

8.7 Implementation of policies and decisions

The problems which militate against the sustainability of QIS partly emanate from non-compliance with some essential provisions of the scheme's development policy. The managing agents did not implement the development policies as formulated: some aspects of the policies were simply ignored. The irrigation policy clearly obliged the irrigation farmers to pay for the services they receive from the management of the scheme including water for irrigation (see Section 4.3.2 of Chapter 4). In 1990/1 Financial Year for instance, QIS lost R1,1 million (approximately 25% of the additional funding required for the Financial Year) “due mainly to [cost] recovery inefficiencies” (Qamata Irrigation Scheme, 1991:1). Since the inception of the scheme, efforts have not been made to request the farmers to pay for the use of irrigation water.[97] As discussed in Section 4.3.6 of Chapter 4, even under the new National Water Act, the Water Users Association at Qamata has not been able to formulate policies to either regulate the use of water by the farmers or impose levies for the use of water. The management has overlooked an important source of revenue. According to Maitin (1990:5) the conveyance of water from the Lubisi Dam to the irrigated plots constitutes approximately 30,3% of the operation and maintenance expenditure of QIS. Besides, the canals and weir and lei dams have to be maintained and above all the water technicians and bailiffs have to be remunerated (Personal communication with Mr Dhlangisa, the Manager of QIS on 8 April 2008). Because the access to water is free at QIS, there is no incentive on the part of the farmers to expend time and resources to ensure efficient use of it. As noted by Denison and Manona (2007:46), the implementation of sections of the National Water Act relating to Water Users’ Association at the Qamata Irrigation Scheme has been reckless.

The ineffective use and subsequent abandonment of a significant proportion of the irrigated plots at QIS noted in Section 4.3.1 of Chapter 4 is blamed on the failure of TRACOR and the scheme’s management structures since 1994 to implement aspects of the irrigation development policy which provides for the appropriation of abandoned plots and the plots of incompetent farmers and the reallocation of the confiscated plots to successful farmers. As

[97] The researcher obtained this information at group discussions at QIS with extension officers on 2 September 2005 (Appendix 7, item 18) and irrigation farmers on 5 September 2005 (Appendix 8, item 28).

indicated in Section 8.3 of this chapter, since the early 1980s the management of the scheme has not evoked the provisions to exert pressure on the smallholder irrigators to cultivate their plots at the scheme. The decision to cultivate the irrigated food crop plots is taken by the individual farmers. It is difficult to envisage how QIS can accomplish its objectives of reducing poverty, household food insecurity and unemployment if the plot holders are not obliged to put their holdings into effective use.

8.8 Techniques of production

Two forms of techniques of agricultural production prevailed at Qamata under the management of Inter-Science and TRACOR: (i) mechanized, high-yield and higher risk commercial farming at Lanti Farm; and (ii), labour-intensive, lower-risk and lower-input method in the smallholder sector (see Section 4.3.1 of Chapter 4). The Lanti Farm had two functions to fulfil, namely, to support the development of the smallholder sector and to generate employment opportunities to reduce outmigration of the local people.

8.8.1 Techniques of production at QIS

The techniques of farming at QIS used by the smallholder irrigators are quite the same as those used in the dryland communities. Table 7.1 shows that the two types of farming at Qamata share a similar characteristic in terms of scale of production: over 90% of farmers in both categories of farmers are engaged in subsistence farming. The irrigators display some sophistication by using herbicides, mechanized means of ploughing and applying more chemical fertilizers. However, these differences are marginal. The irrigators should have exhibited far more superior methods and techniques of production than the dryland farmers, considering the length of time the scheme has been in operation. The only significant difference is that the irrigators have access to water and relatively more regular extension services. In response to item 67 in Appendix 1, 60,5% of the irrigation farmers noted that the only resource they have that dryland farmers do not have is irrigation water.

The similarities in the methods and techniques of farming have their origin in the diffusion of innovation from QIS to the dryland farming communities such as the use of fertilizers and high yielding crop variety and hybrids[98]. Much of the similarities may also be attributed to the use of traditional farming methods by the irrigators such as hoeing and work party system. The cost of equipment required to fully apply the techniques of farming which accompanied the transfer of irrigation technology at Qamata is very high and unaffordable. Besides, the sizes of the irrigated plots are too small to encourage the farmers to acquire the necessary equipment on their own. Hence the policy of land allocation and cost of equipment jeopardized the chances of total adoption of the techniques and methods of modern farming by the smallholder farmers at Qamata.

8.8.2 Effects on unemployment and outmigration

The ability of the Lanti Farm[99] to meet its legal obligation was undermined by the provision in the same policy document which called for the adoption of capital-intensive techniques of production (see Section 4.3.1 of Chapter 4). Most of the limited number of job opportunities created largely benefited the people with specialized skills (e.g. auto mechanics, crop scientists and researchers) due to the demands of mechanized commercial farming. The dearth of such skills in the local community of Qamata meant that much of the required labour was recruited from elsewhere. Maximum employment opportunities arise from labour-intensive techniques of farming and where there are processing and post-processing opportunities. However employment creation demands an income cash stream to pay labour, a requirement the smallholder sector lacks. The impact of QIS on unemployment was therefore limited and outmigration has become the inevitable option. Table 6.10 reveals that outmigration is a common feature of the Qamata community as each household has at least a member working outside the district. A close study of Table 6.30 indicates that in the age

[98] The researcher obtained this information at a group discussion with dryland farmers at Qamata Basin on 7 September 2005 (Appendix 9, item 22).
[99] No primary data was collected from the Lanti Farm as it does not function any longer as an estate or commercial farm.

groups between 20 years and 49 years the proportion of female farmers is larger than that of their male counterparts; since the community is not at war, the only place the young men could have gone to is the urban, industrial and mining centres to look for employment. The QIS has therefore not halted outmigration because not enough employment opportunities have been created to absorb the youth.

8.8.3 Effects on the use of local resources

The mandate of Lanti Farm to initiate and support modern and innovative farming ideas, practices and processes in the smallholder sector of the scheme has had a negative impact on the use of local resources (see Sections 4.5.1 of Chapter 4, 7.3 and 7.4 of Chapter 7). Modernity in the smallholder sector at QIS is construed to mean the use of exotic resources such as tractors, planters and artificial fertilizers. Limited access to these resources in the local community causes delays in planting and harvesting operations, poor yields and high cost of production, thereby jeopardizing the chances of the farmers to achieve household food security. The irrigation development policy has not been successful in encouraging the use and development of local resources and expertise to make the farmers self-sufficient. Moreover the reliance on exotic resources requires subsidies and training which add to the operation cost of the scheme as a whole.

8.8.4 Effects on cost of agricultural production

The adoption of modern methods and techniques of agricultural production has cost implication for the irrigation farmers at QIS. The cost of production increases as the scale of production increases (see Section 7.2 of Chapter 2). The technology required for land preparation under flood irrigation such as ridging, leveling, ploughing and planting is expensive; and poor land preparation adversely impacts on productivity (Matshalaga, 1999:10). The effect of the policy to adopt the kind of irrigation in use at the scheme and techniques of production is that the irrigation farmers hardly benefit from expansion in the scale of production.

8.9 Human capital development

What one gleans from the analyses in Section 7.9.3 of Chapter 7 is that the planners of QIS did not institute any systematic and formal apparatus at Qamata to develop human resources to cater for the demands of irrigated agriculture. The farmers require expertise in production as well as in the disposal of produce. The extension officers at the scheme contend that no facility exists at the scheme for formal training of farmers[100]; besides, training in issues such as marketing[101] is not a part of the routine of the extension service.

The marketing skills of the farmers were particularly limited by the institutional arrangement through which Lanti Farm offered a guaranteed market for the produce of the local farmers (see Section 4.3.2 of Chapter). When Lanti Farm ceased operation as a commercial entity, the farmers found it difficult to sell[102] their produce (Appendix 1, item 104). The lack of well-defined markets and marketing strategies are major problems for the smallholder irrigators. The farmers should have been trained in marketing, especially how to source potential markets and bulk contracts. The lack of training and bargaining capability make farmers vulnerable when they meet commercial customers (Chancellor, Hasnip and O'Neil, 1999:38).

Training of farmers at QIS is seldom demand-led. According to the extension officers, the so-called training is limited to advisory services and a few on-site demonstrations usually relating to new inputs or innovative ideas[103]. It is thus true to argue that the policies on extension services and training did not lay the foundation for effective transfer of skills needed by the farmers to apply the technologies and techniques of production that came with irrigation.

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[100] The researcher obtained this information at a group discussion with extension officers at QIS on 2 September 2005 (Appendix 7, item 15).
[101] Marketing indicates that the farmers have some prior knowledge of demand and grow produce to meet this demand. Marketing takes place in bulk and on an individual basis. It may involve grading, processing or packaging (Chancellor *et al*, 1999:35).
[102] Selling occurs where a farmer grows produce without prior knowledge of demand and attempt to sell on an individual basis to passers-by (Chancellor *et al*, 1999:35).
[103] The researcher obtained this information at a group discussion with extension officers at QIS on 2 September 2005 (Appendix 7, item 15).

8.10 Organisational and institutional support

Smallholder irrigation schemes depend on organisational and institutional support to function. The infrastructure which provides water and inputs used for crop production are provided by institutions and organisations such as government departments, parastatals, private sector institutions and NGOs. For example, as noted in Section 4.3.7 of Chapter 4, government departments and parastatals are important sources of finance, equipment and expertise for QIS. Besides the need for water, one important challenge the smallholder irrigators face is the amount of produce that must be sold to cover costs. Marketing is not an activity that smallholders find easy. Organisational and institutional arrangements assisted farmers to dispose of their produce, usually at guaranteed prices, as under the management of Inter-Science and TRACOR at Qamata before 1994. The other essential services offered by institutions and organisations are access to credit and training (capacity building). At QIS important aspects of institutional services (such as marketing and capacity building) were largely ignored in the design process. There is therefore a need for institutional clarity with regard to water management, infrastructure, capacity building and land tenure to reduce institutional uncertainties that followed the withdrawal of TRACOR from the scheme. The responsibilities and the right of access of irrigation farmers to institutional services should be clearly defined by policy to initiate a shift in farming behavioural change to where greater risks are accepted and greater returns can be achieved.

An institution that needs to be strengthened is the farmers' association. As much as 82,9% of the irrigation farmers do not belong to any agricultural cooperative society (Table 7.16). It appears the farmers are not organised to protect and promote their interests and rights. The difficulties the farmers experience in procuring subsidized inputs and disposing of their produce could be mitigated through farmers' associations which are capable of sourcing potential markets and bulk contracts. In addition farmers' associations foster the interests of farmers through lobbying with major role players in rural and agricultural development such as the government and the private sector. As Chikanda and Kirsten (1996:322) contend, farmers' associations provide an effective means of communication with input suppliers, research institutions, government and extension service.

The major NGOs which assist the irrigation farmers at QIS are Farmers Support Centre, Farm Africa and Kula. The NGOs have limited impact on the development of irrigation agriculture at Qamata because 54,9% of the irrigation farmers do not receive assistance from any NGO (Appendix 1, item 89). NGOs play an important role in community development because they operate at the grassroots where assistance is much needed and effectively used by the rural poor. With their links in the communities NGOs complement government efforts towards agricultural and rural development (Davids, 2005c:71; Catling and Saaiman, 1996:166). However, NGOs are more successful in the transfer of agricultural technologies to the rural poor than government departments and parastatals because of their reliance on low-cost technologies as well as their insistence on the use of local resources and expertise (Davids, 2005c:70). The limited use of local resources at QIS may be attributed to the limited role NGOs played in state sponsored community development initiatives in the former Transkei. The South African government and the Bantustan authorities designed policies to frustrate the efforts of NGOs in the former Transkei (Meer, 1999:110) because of the need to curb the opposition to the homeland policy which was in vogue before 1994 (see Section 3.7.1 of Chapter 3).

8.11 Impact on welfare

A number of observations relating to the impact of Qamata Irrigation Scheme on poverty alleviation, outmigration, and the source of household food supply have been made in the research findings presented in Chapters 6 and 7. The observations are summarized as follows:

(i) at Qamata the irrigation farmers have a more secure access to food than the dryland farmers although over a quarter of the irrigation farmers cannot meet their households' food needs from their farming activities;

(ii) there is unemployment in the Qamata area therefore rural-urban migration has not eased;
(iii) access of both irrigation and dryland farmers to cash (annual turnover from agricultural activities) is restricted, indicating widespread poverty; and,
(iv) inequality in the distribution of annual turnover exists between female and male farmers and between subsistence and commercial farmers.

What one gleans from the above observations is that in spite of the establishment and continued operation of QIS the Qamata community still experiences problems of unemployment, outmigration of people, poverty and household food insecurity. These problems which impact adversely on the welfare of the farmers and their households have their origin in the development policies through which the Qamata Irrigation Scheme was established. The individual plot holdings are too small to sustain adequately the food requirements of most households or to create employment for a large number of people; and the land allocation system which created the two categories of farmers, subsistence and commercial, lies at the root of the inequality in the distribution of annual turnover. Moreover organisational and institutional support and services are inadequate to induce intensive cultivation to compensate for the smallness of the size of the farms.

8.12 Effects of macroeconomic policies on smallholder irrigation

Macroeconomic policies are enacted to reform the entire economy of a country ostensibly to strengthen all sectors of the economy. The post-apartheid macroeconomic policy (GEAR) introduced a cost-recovery factor in the development process (see Section 3.8.2 of Chapter 3). Macroeconomic policies which seek to recover cost from the beneficiaries of development programmes (Department of Finance, 1996:14) have contradictory effects on irrigation agriculture. As the main aim of macroeconomic policies such as structural adjustment programmes (SAPs) and GEAR is to reduce government expenditure (Rural Development Task Team, 1997:15-19), subsidies and various forms of aid to the poor people are removed and austerity measures are imposed.

Trade liberalization which accompanied GEAR permitted traders to charge exhorbitant prices for their merchandise. The smallholder irrigation farmers are hard hit because prices of inputs such as fertilizers and seeds rise. Because of problems of affordability the farmers reduce the use of inputs; minimal use of inputs results in low yields and reduced income from farming. As Table 7.6 indicates, at QIS 3,9% of the irrigation farmers do not apply fertilizers on the plots for crop production. The price of water however remains the same after the introduction of GEAR in 1996: irrigation farmers continue to use water free of charge at Qamata.

8.13 Summary

The development and management policies and the methods of their implementation at Qamata have not been appropriate in dealing with the complexities and uncertainties inherent in the transfer of irrigation technology to the rural poor. The policy objectives are conflicting because the beneficiaries of the development policies were not involved in their formulation. The exclusion of the people from the formulation of the development policies meant that the resultant policies did not reflect the actual needs and potential of the people. The Qamata Irrigation Scheme as a project provided a means of translating the development policies into programmes of action (Rondinelli, 1993:6). It is therefore not surprising that the techniques of production which accompanied the irrigation development at Qamata did not reflect the capabilities of the people and the available local resources. The sizes of the irrigated plots and the tenurial arrangements demonstrate that the planners of the scheme did not understand the needs and aspirations of the beneficiaries.

The essence of irrigation technology transfer is to build the capacity of the recipients to make them self-reliant in their struggle for survival. The institutional support and services which accompanied the establishment of the scheme were equally inappropriate. Firstly, there were inadequate training facilities to train the local farmers in the art of modern irrigation farming. Secondly, the organisational structures established at the scheme alienated the farmers as they were excluded from the management and administration of the scheme. The sum effect of the inherent weaknesses of the development policies and the organisational setup is the failure of the scheme to achieve the intended objectives of alleviating the problems of poverty, unemployment, food insecurity and outmigration of the youth. Besides, the farmers could not develop entrepreneurial and management skills to run the scheme on their own as demanded by the concept of irrigation management transfer defined by the prevailing macroeconomic policy, GEAR.

The next chapter concludes the study with recommendations which are based on the research findings presented and analysed in Chapters 6 and 7 and the policy implications of the research findings discussed in this chapter.

CHAPTER 9

CONCLUSIONS AND RECOMMENDATIONS

9.1 Introduction

After the publication of the Tomlinson Commission report in 1955, most of the large-scale irrigation schemes in the former homelands in the Eastern Cape Province were established to redress socio-economic problems that the Commission identified, prominent among which were poverty, unemployment, food insecurity and destitution (Commission for the Socio-Economic Development of the Bantu Areas within the Union of South Africa, 1955:62-64). However, the problems have persisted over the years since the establishment of irrigation intervention projects. Given the severity of inadequate rainfall that threatens agricultural production in the Eastern Cape, the question which comes to mind when one reflects on the performance of the irrigation schemes in the former homelands is, how do state irrigation technology transfer programmes benefit the farmers? As reiterated earlier, the irrigation schemes *per se* are certainly not a waste of investment resources; it is the organisational and support systems, especially public policy and management practices, which have hindered the realisation of the intended objectives of the irrigation technology transfer programme.

The aim of this study was to investigate the role of public policy in the transfer of irrigation technology as a means of resolving the socio-economic problems in rural areas in the former homelands of the Eastern Cape, investigating in particular the Qamata Irrigation Scheme, and the farmers' response to government initiatives. The discussions which follow illustrate how the aim and objectives of the study (see Section 1.3 of Chapter 1) have been accomplished.

9.2 Conceptual and theoretical reflections

Before presenting the key findings from the earlier chapters, I wish to recap my main conceptual and theoretical approaches.

9.2.1 Methodology

The eclectic nature of the study has given it the characteristics of a systems approach to the study of the role of public policy in the transfer of modern agricultural production technology to the rural poor through irrigation development. The use of multiple sources of data and analytical concepts and models provided an appropriate means of describing, quantifying and evaluating the physical, environmental and human resources and institutional structures and frameworks at Qamata in order to present a holistic picture of the social economy of the area.

9.2.2 Public policy

Public policy is interpreted in this study as a purposeful course of action developed by government bodies and officials to attend to issues of public concern. This study thus sees development policy as a powerful and useful instrument with which political and planning authorities can shape and direct the actions of impoverished rural communities to predetermined and potentially desirable goals through the transfer of irrigation technology. Implicit in the definition is the notion that rural and community development is an arena where struggle, competition, negotiations and encounters take place among actors such as local, provincial and national government officials, farmers, interests groups and tribal authorities. Thus development policy is a set of rules that can bring predictability to social interaction and produce a measure of order out of the chaos in the development process. The definition presupposes that the transfer of irrigation technology to Qamata and the ensuing goals and outcomes of development efforts are determined by the development policy.

9.2.3 Irrigation technology transfer

Irrigation was interpreted in this study as a socio-technical phenomenon. Such an interpretation provides a way of looking at how development policy shapes human actions and behaviour around water; for instance, it helps us to understand how development policy influences the choice of techniques and methods of agricultural production in impoverished rural communities through the transfer of irrigation technology. The term irrigation technology in the context of this study does not imply the technologies that convey water to the cultivated fields. The term was used to refer to the essential expertise and skills required to apply the available water to increase agricultural production in smallholder irrigation schemes. Similarly, irrigation technology transfer was defined as the building of the capacity of smallholder irrigators so that they can fully use the technology, resources and services that accompany the establishment of irrigation schemes to step up production.

9.2.4 Human aspects of irrigation development

Irrigation development is a human activity and for that matter a social venture. It is not therefore a mere physical task of conveying water to cultivated fields. An irrigation scheme is rather a system for producing crops and a place for a community of people and households to live healthy and fruitful lives while working cooperatively and contributing to both local and national food security. The success of an irrigation development project thus depends on the quality of human resources invested in it and a framework of public policy which gives direction, purpose and meaning to it.

The human resource approach helps in isolating the effects of local skills on irrigation development and the impact of irrigation technology on the development of new techniques of production by the local farmers as well as non-farm workers.

9.3 Key findings

Using the objectives, hypotheses and research questions of the study as guides, this section summarizes the key findings presented in the earlier chapters without necessarily repeating the findings.

9.3.1 Institutional support and services

The proper functioning of Qamata Irrigation Scheme depends on the availability of institutional support and services (see Section 7.9.2 of Chapter

7). The Department of Agriculture, Department of Land Affairs and Department of Water Affairs and Forestry are the state institutions which offer assistance to the farmers at the scheme and since 1994, ESKOM, Eastern Cape Development Corporation (ECDC), Independent Development Trust (IDT), Office of the Premier of Eastern Cape and Chris Hani District Municipality have become significant benefactors of the scheme (see Section 4.3.7 of Chapter 4 and Table 7.17). The assistance obtained from these institutions includes irrigation infrastructure, subsidized inputs, extension services and credit and marketing services. The annual turnover from agricultural activities at QIS depends on the assistance that state institutions offer to the scheme and the smallholder irrigators: the farmers' access to cash is thus influenced by public policy. However, the assistance from state institutions does not influence the main source of household food supply; the assistance the government departments offer benefits the commercial farmers more than the food crop farmers.

The findings on institutional support and services suggest that not all forms of gender subordination have been successfully deconstructed because the female farmers at QIS have limited access to institutional support and services (Table 7.19). Women still do not have equal access to productive factors such as credit and marketing facilities, extension service and inputs. The effect is that the output of female farmers at QIS is less than that of their male counterparts (see Section 6.2.1 of Chapter 6): productivity is defined in terms of turnover of all agricultural activities (see Section 6.1.2 of Chapter 6).

In the dryland farming community, the assistance from government departments does not influence the annual turnover from agricultural activities. The assistance offered by the institutions may be inadequate or inappropriate. This observation suggests that a gulf exists between the institutions that assist farmers in the dryland farming community and the dryland farmers, resulting in a poor communication and poor appreciation of the dryland farmers' needs and expectations.

9.3.2 Development of farming skills

Skills development (capacity building) is the core of irrigation technology transfer because it enables the farmers to adopt and apply the techniques of production and other processes that come with the supply of irrigation water. None of the farmers at Qamata has an academic or professional qualification in agriculture (Appendix 1, item 8 and Appendix 2, item 8). However, the irrigation development policy at QIS did not provide for the formal training of the farmers in irrigation agriculture. The lack of farming skill thus constitutes a major problem for a far greater majority of the irrigation farmers (see Subsection 7.9.3.1 of Chapter 7). The majority of the farmers cannot exploit the full potential of the available facilities and services at the scheme in order to reduce poverty and improve household food security.

9.3.3 Development of managerial and entrepreneurial skills

There is a dearth of managerial and entrepreneurial skills at QIS (see Subsection 7.9.3.2 of Chapter 7). The level of education of the irrigation farmers is too low to influence their bookkeeping and managerial skills. No facility for basic training in bookkeeping and marketing exists at the scheme. The lack of bookkeeping skills means that the farmers do not have accurate records of farm transactions to help them to make informed investment decisions. A substantial proportion of the irrigation farmers do not apply for loans and credit. With limited access to cash, and without loans and credit the farmers cannot expand their farming activities or invest in off-farm ventures. The development of entrepreneurial skills is therefore hampered. The lack of entrepreneurial and managerial skills negatively affects output at the farm level, resulting in widespread poverty, food insecurity and unemployment and disguised unemployment at Qamata.

9.3.4 The use of local resources

The irrigation farmers prefer exotic resources (tractors for ploughing and planters) to locally available resources (animal drawn wooden ploughs) (see Section 7.3 of Chapter 7). Although mechanical ploughs are in short supply, the farmers do not use animal draft power for land preparation for cultivation. The use of mechanical ploughs which are in short supply results in delays in planting and leads to higher costs of production. In addition, the smallholder irrigation farmers use more chemical fertilizers than kraal manure: this practice also adds to the cost of farm production. The techniques of farm production employed at the Lanti Farm at QIS did not encourage the smallholder irrigation farmers to develop interest in the use of local resources.

9.3.5 Inequalities in annual turnover from agricultural activities

Inequality exists in the distribution of annual turnover of agricultural activities between male and female farmers (see Section 6.2.1 of Chapter 6) and commercial and subsistence farmers at QIS (see Section 7.2 of Chapter 7). The distribution of annual turnover is skewed in favour of the male farmers (Table 6.4). The access of female farmers to inputs and institutional services is less than that of the male farmers. In addition the greater majority of the female farmers are engaged in subsistence agriculture (Table 6.3). The distribution of annual turnover of agricultural activities favours of the commercial farmers because the size of their allotments is bigger than the subsistence farms (see Section 4.3.1 of Chapter 4).

9.3.6 Poverty alleviation

The majority of both irrigation and dryland farmers have limited access to cash as a greater proportion of the farmers' annual turnovers are below the poverty datum line (see Section 7.2 of Chapter 7). The low annual turnovers are the direct consequence of widespread subsistence farming and inadequate institutional services and support at the scheme and in the surrounding villages. Judging from the low annual turnovers and widespread subsistence farming, one is inclined to conclude that rural poverty is equally widespread at Qamata: the transfer of irrigation technology has not had a desirable impact on rural poverty. The scheme has therefore not achieved the objective of alleviating poverty at Qamata.

9.3.7 Food security

For a significant portion of the irrigation farmers, farming does not constitute the main source of their household food supply (Section 7.2 of Chapter 7 and Table 7.2). Food insecurity at Qamata is attributed, among others, to the widespread subsistence farming and inadequate institutional support and services (see Section 7.9.2 of Chapter 7).

9.3.8 Unemployment and outmigration

There is a dearth of employment opportunities at Qamata (see Section 7.10.4 of Chapter 7): unemployment is thus rife. Investments in agriculture and off-farm activities are limited due to the lack of entrepreneurial skills and credit facilities. Owing to endemic poverty, the informal sector cannot expand to create employment (see Section 6.3.4 of Chapter 6). The corollary of unemployment is outmigration of the youth (see Section 7.10.5 of Chapter 7).

9.3. 9 Techniques of agricultural production

The techniques of farming at QIS and in the dryland farming communities are basically similar in terms of scale of production, resources and inputs (see Section 8.8.1 of Chapter 8). However, the irrigation farmers rely more heavily on tractors to plough. Besides, the irrigators apply more chemical fertilizers than the dryland farmers.

9.3.10 Influence of development policy

The failure of the Qamata Irrigation Scheme to achieve its intended objectives of reducing the problems of poverty, unemployment and outmigration of people is also attributed to conflicting and self-defeating provisions in the irrigation development policy (see Section 8.2 of Chapter 8) and the haphazard fashion in which policies and decisions were implemented (see Section 8.7 of Chapter 8). An important feature of the irrigation development policy is its top-down character. The beneficiaries of the policy were excluded from the formulation of the policy (see Sections 7.9.1 of Chapter 7 and 8.5 of Chapter 8).

9. 4 Implications of the findings

The above exposition of the research findings suggests that all the five hypotheses of the study outlined in Section 1.4 of Chapter 1 should be accepted. Accordingly:

(i) the institutional support and services that were provided at QIS were inappropriate and inadequate as they did not address the central issue of human capacity building; therefore, most of the irrigators cannot expand production beyond subsistence level in order to reduce poverty, create employment and attain household food security;

(ii) the use of relatively expensive exotic resources (e.g. tractors and planters) which are in short supply at QIS delays planting and increases the cost of farm production; hence, the poverty-stricken farmers cannot expand production beyond subsistence level;

(iii) the irrigation development policy at QIS could not establish the necessary conditions and environment for the farmers to realize their human potential: the development policy rendered the scheme unsustainable and unviable;

(iv) the absence of human resources development policy at QIS resulted in the lack of entrepreneurial and managerial skills at the farm level; therefore, the farmers at could not invest in agricultural development and non-farm ventures in order to create employment, reduce poverty and achieve food security; and,

(v) the transfer of irrigation technology created inequalities in the distribution of income (access to cash) between the commercial and food crop irrigation farmers at QIS and between the irrigation and dryland farmers.

The role and importance of public policy in shaping and directing rural intervention programmes through the transfer of irrigation technology reverberates throughout the study. Rural and agricultural development is a complex activity and thus requires a well informed development policy. The non-participatory manner in which the initiative to establish QIS as a means of transferring irrigation technology and skills to the rural people at Qamata was formulated and implemented has had far reaching consequences for the local social economy. The irrigation technology transfer programme did not succeed in the true sense in reversing the conditions of underdevelopment at Qamata characterized as it was by poverty, unemployment, outmigration of the youth and household food insecurity which were created and perpetuated by years of colonialist and segregationist policies (see Chapter 3). The Qamata Irrigation Scheme has however benefited, relatively speaking, a few of the irrigation farmers and their households.

The policy to transfer irrigation technology to the rural people at Qamata lacked focus: it was torn between the provision of means of sustenance for as many people as possible and the creation of a sound basis for local economic development and wealth generation. The approach was rooted in the dominant development paradigm which was in vogue, the growth centre or top-down development strategy. The research findings and analyses thereof presented Chapters 6, 7 and 8 suggest that the trickle down effects of the central irrigation facility at Qamata to the adjacent areas have proved to be largely unsuccessful.

There is no evidence to suggest that the investments by the so-called commercial farmers and the state in commercial farming at QIS benefited the less progressive farmers at the scheme and dryland farmers in the adjacent villages in terms of skills acquisition and capital formation for agricultural development (see Section 7.9.3 of Chapter 7). This observation further suggests that the rural community is not a passive recipient of a government intervention programme designed ostensibly to improve the lives of the rural poor. What the observation implies is that centralized planning and policy formulation, which are fundamentally paternalistic in inclination as they exclude the beneficiaries from participation, are not appropriate options for rural and agricultural development as exemplified by the case of the Qamata Irrigation Scheme. By sidelining the local community, the development policy at Qamata lacked a crucial insight into the inherent requirements of the beneficiaries that were essential for the success of the irrigation development programme.

9.5 Looking to the future

Although the provision of irrigation water to the rural poor is a big step towards alleviating poverty and mitigating food insecurity, it can be inferred from the findings of the study that additional organisational and institutional measures are required to make the transfer of irrigation technology to the rural people viable and sustainable.

9.5.1 Choice of technology

It is important that the choice of techniques and methods of production that accompany the transfer of irrigation technology correspond with the capacity of the end users of the irrigation infrastructure. The introduction and adoption of inappropriate techniques and methods of farm production disrupt the farming systems the local farmers have known and practised for many years. For the poor rural community at Qamata, where almost each household has some cattle, it is prudent to develop and improve animal draft power to be more efficient in terms of human resources and time to supplement and, whenever necessary, provide a suitable alternative to the use of tractor power. The technology should be labour-intensive and easily accessible in terms of the availability of equipment and the cost of acquisition and maintenance. The most appropriate technology is one in which equipment and tools can be cheaply and successfully repaired by the end users themselves.

Much of the inadequacy in the use of local resources at Qamata lies in the organisation and management of QIS. It is important that the development policy provides for the establishment of an appropriate technology unit (besides the extension service unit) charged specifically with the responsibility of surveying, studying and assessing the existing traditional methods and techniques of farm production as well as ascertaining the available local resources and expertise. On the basis of the outcome of the study and assessment, the unit should scientifically and technologically improve the traditional methods and techniques of agricultural production known in the community to suit irrigation farming. It is extremely important that all the stakeholders at the irrigation scheme (e.g. government departments, parastatals, NGOs and the local communities and farmers) participate in choosing the appropriate technology and equipment for the scheme. The appropriate technology should enhance the use of local resources and reduce the reliance on exotic tools and equipment.

The unit should continually research ways of improving the effectiveness, reliability and efficiency of the methods and techniques of production. Since new technologies bring about changes that are not always easily foreseen, the functions of the unit, among others, should include the education and training of the local community to accept, adopt and utilize the appropriate technologies the unit introduces to facilitate local development. After all development is about change which includes change in attitudes towards appropriate technology and the use of local resources. However, the smallholder irrigation farmers need information on the availability of spare parts and repair requirements and on the advantages and disadvantages of the available technologies so that they are able to make an informed choice.

9.5.2 The role of women

As female farmers' contribution to agricultural production is substantial, gender equity ought to be accorded importance in irrigation technology transfer policies. Farm operations and practices should be designed to suit the general requirements of women. In order for irrigation technology to be effectively applied for the betterment of the people in general, irrigated plots should be allocated to female farmers on equal terms with male farmers. It is the female farmers who produce the bulk of the food crops on which the households depend for food (Festus, 2003:170); however, men are usually the registered users of irrigation plots. It follows then that if women were given unimpeded access to resources such as land, credit, infrastructure, training and equipment, the chances of ensuring food security of rural households via irrigation technology transfer could be enhanced. The recognition of gender differences is central to the creation of gender equity in the development process as rural women could be targeted as beneficiaries of development assistance.

At QIS the foundation of gender bias was laid by the irrigation development policy which allocated the irrigated plots to male farmers (see Section 4.3). The existing irrigation development and technology transfer policies should therefore be revisited with the view to repealing all gender bias provisions, and future irrigation policies should ensure gender equity at the outset. The management, stakeholders and the local communities must establish a committee empowered to ensure that gender-aware strategies are used at the scheme to guarantee equal participation and equal access of all farmers to the available resources and facilities. The committee should be mandated to query and deconstruct gender-based discriminatory practices at the scheme.

9.5.3 Targeting the youth

The concentration of the aged at QIS is a drag on irrigation and agricultural development as the aged farmers lack the vitality and dynamism required for large-scale farm production. It is possible to revitalize QIS (and for that matter any other existing smallholder irrigation schemes) by attracting younger people to replace the farmers aged over 60 years. As a condition for the households to retain ownership of irrigated plots at the scheme, the development policy should require that younger people from the aged farmers' households avail themselves to be selected and trained in the art of irrigation farming in order to take over from the aged farmers. The irrigation development policy should therefore provide for the establishment of training centres and facilities (with skilful facilitators besides the extension team) at the scheme where the young prospective farmers would be formally trained and equipped with essential skills to enable them to meet the requirements and demands of sustainable large-scale irrigation farming. Only the prospective young farmers who successfully complete the training programme should be allocated irrigated plots at the scheme.

After such training the prospective young farmers should be officially given the right to cultivate their household irrigated plots at the scheme. They should be given resources to start with which should be repaid after a given period of farming. All the farmers aged 60 years or more should retire from active farming and be registered for old age state pension. The irrigated plots of aged farmers who do not have any younger persons interested in farming in their households should be given to trained prospective young farmers from other households within the same community. All the irrigated plots which have been abandoned should form part of the new programme. The approach should be considered within the broader context of irrigation management transfer (IMT) (see Section 2.11).

9.5.4 Land allocation and tenurial arrangements

The young farmers should till their allotments for profits on full-time basis. However the existing holdings are not economic because the sizes are too small to make farming viable and sustainable. It is therefore necessary to revise the plot allocation system to increase the sizes of the plots from a minimum of 5ha to 10ha to make irrigation farming a rewarding economic venture. The revision of the plot allocation system should be guided by the irrigation development policy which should itself be a product of stakeholder and community deliberation. The active and meaningful participation of the local community and irrigators is very important because the revision and the consequent amalgamation of plot holdings will inevitably incur the displeasure of some parties as a considerable number of farmers will be displaced. Owing to the emotions and sensitivity that land allocation usually creates, it is important that a special committee, consisting of the representatives of all the stakeholders and officials from the Departments of Agriculture and Land Affairs, is set up to revise the current tenurial arrangements at the scheme. The committee should work out an acceptable package of compensation for the displaced farmers.

The current system where the plot holder clings to the plot indefinitely does not augur well for effective utilization of the irrigated plots. The new farmers should be allowed to cultivate the irrigated plots up to the age of 50 years and thereafter the plots should be reallocated to other farmers of a younger age. However, before the age of 50 years, a plot holder should lose possession of the plot if, for any reason, it is abandoned for more than one farming season. In addition realistic annual targets of production should be set for the farmers to accomplish in order to justify possession of the plots.

9.5.5 A new irrigation development policy

The approach outlined above together with inputs from all stakeholders and the public at large should be crystallised into an irrigation development policy with well defined objectives, institutions, functions, responsibilities, privileges and rights. It should represent the context within which irrigated agriculture should be rehabilitated and improved at QIS. The new irrigation policy should offer the legal framework for the rehabilitation processes and changes at the scheme to be carried out. For example, it should provide the irrigation farmers with security of tenure for land and water and the power to seek redress when contracts are broken. The policy should be crafted within the national guidelines set by the National Water Act of 1998 and the rules and regulations defined by the White Papers and publications of DWAF and DoA as discussed in Section 2.6 of Chapter 2. Besides, the policy should provide for effective monitoring and evaluation mechanisms to manage unforeseen shortcomings of the rehabilitation and development processes. It is essential that the contents of the irrigation policy be formalized into a single document to facilitate accessibility and quick reference. The new system of plot allocation and tenurial arrangements should be unambiguously defined in the irrigation policy.

The cost recovery elements of irrigation management transfer (IMT) and the macroeconomic policy of the national government, the Growth, Employment and Redistribution (GEAR), should be reflected in the irrigation development policy. The policy should align with realistic economic outcomes. Hence catch phrases such as ‘poverty alleviation’, ‘employment creation’ and ‘food security’ which connote social rather economic motives of development should be avoided or be redefined by all stakeholders to reflect the expected outcomes of irrigation development at Qamata.

9.5.6 Institutional arrangements

The institutions and organisations which manage and administer the scheme should be clearly defined and their functions and privileges specified without ambiguity in the irrigation development policy. Institutions and organisations play important roles in irrigation technology transfer as they provide resources for the proper functioning of the scheme and enact rules to regulate relationships among stakeholders. It is therefore true to argue that the performance of the rehabilitated QIS would be directly linked to the quality of the institutional and organisational arrangements that are instituted to manage the scheme. The institutional and organisational arrangements include, among others, the management of the scheme, infrastructure and support services and the relationship between the stakeholders and between the scheme and other institutions outside the scheme.

Each of the three spheres of government has roles to play. The national government should provide a coherent policy for irrigation development. The policy should provide the framework within which irrigation farming in rural communities should be pursued and the kind of technology that should accompany the supply of water to manage agricultural production in the participating communities. At Qamata the provincial Department of Water Affairs and Forestry should provide and maintain the irrigation infrastructure at the scheme because the skills and expertise these functions require are not available in the local community. Both the national and provincial Departments of Agriculture should provide the support and services (such as capacity building, credit, marketing and subsidized inputs) needed for the uptake of irrigation farming. The details of the policy should be worked out at the scheme level to produce a comprehensive policy for QIS with the assistance of the district and local municipalities in a participatory fashion with a view to making optimum use of the available local resources and expertise.

The Water Users' Association (WUA) at Qamata should be resourced through training and provision of resources to enable it to execute its functions as required under the National Water Act of 1998. The irrigation scheduling function of the WUA should be executed with diligence because irrigation scheduling profoundly affects the overall productivity of the irrigation scheme. The irrigation policy of QIS should oblige the farmers to establish and belong to a farmers' cooperative society which would contribute to policy formulation and management of the scheme and provide access to subsidized inputs and credit and safeguard the interests and well being of the farmers. Marketing of farm produce, extension service and maintenance of infrastructure are essential services which should be entrusted to well defined institutions accountable to the farmers' cooperative society and the management of the scheme.

Public sector institutions (e.g. government departments, IDT, ESKOM and ECDC) are among the major stakeholders at the Qamata Irrigation Scheme (see Section 4.3.7 of Chapter and Table 7.17). These institutions have a profound impact on productivity and livelihoods at QIS as they provide the bulk of the assistance required for farm production at the scheme (see Section 7.9.2 of Chapter 7). Both public sector institutions and NGOs need entry points into the scheme. The policy of QIS should provide the entry points via an open door policy to secure assistance to develop all forms of capacity required at the scheme. The gulf between the institutions and the scheme results in poor communication and poor appreciation of each other's needs and expectation. The establishment of long term partnerships between QIS and the institutions is seen as an effective way to ensure that they work in close collaboration with each other, especially at the farm level in order to strengthen communication and cooperation between the farmers and the institutions.

The management of Qamata Irrigation Scheme should network with other smallholder irrigation schemes, research institutions, NGOs, Chris Hani District Municipality and Intsika Yethu Local Municipality. "Networking refers to the various formal and informal networks that are instrumental in disseminating knowledge and innovation" (FAO, 2004:9). Networking with research institutions and NGOs would grant QIS access to innovation and improved crop production practices. The lack of resources and expertise prevents QIS from establishing its own research station. Chris Hani District Municipality, as a benefactor of the scheme, and Intsika Yethu Local Municipality could offer resources and training for the farmers if meaningful networks are established with them. Networking with other smallholder irrigation schemes would offer a chance for the WUA to learn from others to improve its services at Qamata. Besides, the farmers would interact with other irrigators to exchange ideas which would improve their farming methods and livelihood strategies. As farmers from different schemes interact and discuss issues of mutual interest, awareness would be created and the farmers would be able to protect their rights and privileges.

9.5.7 Rights and privileges of farmers

The proposed approach to smallholder irrigation farming at QIS should be executed in the context of a free and democratic society. Coercion and intrusive practices on the part of the management or any institution, especially with regard to reallocation of irrigated plots and changes in tenurial arrangements, are likely to jeopardize the chances of the recommended approach succeeding. Besides, the knowledge of the farmers and their efforts to reconstruct their livelihood strategies to bring about security and dignity for themselves should be acknowledged and respected. The following structures and practices should be instituted at QIS in order to encourage and solicit the cooperation and participation of the farmers and the community.

(i) Democracy should be the foundation of governance and administration at the scheme. There is a need to focus on equitable participation of the farmers in the scheme's administration. The selection of the representatives of the farmers to the scheme's management, for instance, should be based on free and fair elections. More importantly, decisions and policies that affect the farmers should be the outcome of consultation and deliberation. Non-democratic forms of social mobilization often lead to patronage and coercion which are likely to scare off the farmers and the community from social and political participation (see Section 7.9.1 of Chapter 7).

(ii) The knowledge and understanding of issues at QIS are crucial to the active participation of the farmers in the affairs of the scheme. Complex policy issues should be well publicized and reduced to simple language that the farmers with little or no formal education can comprehend. The irrigation policy should provide for the creation of a farmers' forum for each of the six sections of the scheme where policies and other matters of concern to the farmers would be explained and discussed. The contributions of the farmers on policy issues should be entertained and treated with respect. The forums should be used to educate the farmers on the rights and responsibilities of the government and the citizenry.

(iii) Civil society organizations are important elements in socio-economic development at grassroots or village level. An effective farmers' cooperative society at QIS could provide the platform for the discussion of local issues of concern and could assist in crystallizing them into policies. As a way of encouraging the farmers to join the cooperative society, financial assistance and subsidized inputs should be provided to the farmers via the farmers' cooperative society, and the access to these essential services should be reserved for the members of the cooperative society.

(iv) The progressive and creative leaders of the farmers' forums and the cooperative society who are familiar with the complexities of local politics, conditions and development could be identified in the course of time. The scheme's management could initiate a policy that could permit such leaders to lead the process to devise realistic plans and programmes of action for the development of the scheme. The basis for selection of the leaders of the farmers' forums and the cooperative society should always be free and fair elections.

9.5.8 Capacity building

The irrigation policy should prioritize the capacity development of the scheme's entire workforce (e.g. irrigation farmers, extension workers, technicians and the scheme's managers at all levels). Capacity building would enable all categories of workers at the scheme to acquire the essential skills needed to meet the challenges of irrigation farming. The training should improve the technical as well as managerial and entrepreneurial skills of the farmers to ensure effective management at farm level. It should prepare the farmers to eventually take over the management and administration of the scheme (see Section 2.11 of Chapter 2). Capacity building should be guided by clear strategies that address development and production needs of the beneficiaries of the scheme. Irrigation technology transfer and skills development should be at the core of the rehabilitation and development processes and be pursued on a permanent basis. Capacity building should therefore be seen as an important process of transferring irrigation technology and essential skills to the local community and not a temporary fix for correcting investment failures. The approach to capacity building should be based on participatory training methods to secure the interest and cooperation of the stakeholders.

The training of extension personnel should be reviewed to enable extension workers to respond appropriately to the requirements of the irrigation farmers. The extension staff should be well trained and resourced in order to meet the extension needs of the farmers. The training should be comprehensive enough to cover the essential aspects of extension programme such as credit, finance, marketing and risk and disaster management among others. The training facilities at the scheme should be available to train other members of the community to acquire new skills to enable them to establish viable and sustainable income generating activities to cater for the casualties of the new approach to smallholder irrigation farming recommended.

9.5.9 Risk and disaster management

There is a need for the establishment of a unit at the scheme to be charged with the function of risk and disaster management as farming is fraught with great many uncertainties: the farmers should be assisted in an unfortunate incidence of a natural or man-made disaster. The following risk management tools should be promoted by the risk and disaster management unit at the scheme:

(i) the establishment of an early-warning system that provides timely, accurate, relevant, free and user friendly information about the weather to farmers through the farmers' forums, farmers' cooperative society, rural information centres and the media. The unit could also help to reduce market and price risks through good and timely information.

(ii) the creation of a subsidized agricultural insurance scheme to cushion farmers against crop failure as a result of both man-made and natural disasters. The insurance scheme should appropriately be designed in partnership with the state, farmers and private insurance firms;

(iii) the establishment of a comprehensive training and awareness programme for farmers to encourage the use of agricultural futures market; and,

(iv) the intensification of efforts to manage HIV/AIDS, combat crime and cushion the farmers against the negative impacts of macroeconomic policies.

9.6 Summary

The Qamata Irrigation Scheme, as a smallholder irrigation infrastructure, has brought the local farmers into contact with modern irrigation technology, which in itself is an achievement. However, one can hardly argue that irrigation technology has successfully been transferred to the local farmers. The research findings and the subsequent recommendations indicate that the irrigation policy, management practices and institutional and organisational arrangements did not establish a firm foundation for meaningful adoption and use of irrigation technology at QIS. The transfer of irrigation technology therefore has not so far made significant inroads into the problems of poverty, unemployment and food insecurity at Qamata. An important manifestation of inadequate institutional and organisational arrangements at QIS is the complete lack of facilities and programmes to train the farmers. Consequently, for most farmers, farm production has not expanded beyond subsistence production because they lack essential skills in the fields of crop production, farm management and entrepreneurship. The farmers are not capacitated enough to manage the irrigation project profitably and sustainably on their own. There is little doubt that corrective policy action on the part of the Eastern Cape provincial government and the Departments of Water Affairs and Forestry and Agriculture is needed to provide guidelines on institutional, implementation and management issues that restrict irrigation technology transfer at QIS.

This study has attempted to investigate the socio-economic dimensions of the transfer of irrigation technology to rural communities with reference to public policy, state intervention and social economy of rural farming communities. A deeper understanding of the nexus between the determinants of rural poverty, complexities of rural livelihood forms and options and the role and impact of public policies is essential to identifying pathways out of rural poverty, hunger and misery. Should this study contribute in any way towards a greater understanding of how public policy can shape and direct irrigation technology transfer towards alleviating rural poverty and reducing food insecurity and should it provide insight into how to craft public policies which actually promote socio-economic development in the rural areas, especially in the marginal areas of Eastern Cape, then the study would have achieved the purpose for which it was intended.

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APPENDICES

APPENDIX 1

QUESTIONNAIRE FOR IRRIGATION FARMERS

This survey is concerned with the transfer of irrigation technology and rural development in the Qamata area. It covers a wide range of social, political and economic issues.

The aim of this investigation is to solicit information that would enable:

1. the researcher to write a thesis for the degree of Doctor of Philosophy; and,
2. institutions engaged in rural development to direct their actions in a meaningful way.

Accurate information about Qamata area is important in this survey. It would therefore be appreciated if you could answer all the questions accurately.

Your name does not appear anywhere in the questionnaire. In addition, you do not have to sign the questionnaire or any other document. You remain entirely anonymous.

ENUMERATOR: …………………………………………… DATE: ……………………..…
ADMINISTRATIVE AREA: ……………………………… VILLAGE: …………………

**NB: Please mark with X next to the most appropriate answer in the spaces provided.*

A. PERSONAL INFORMATION

1. Age:
   - 1 = Under 20 years: ….
   - 2 = 20 – 29: ……………...
   - 3 = 30 – 39: …………
   - 4 = 40 – 49: ……………...
   - 5 = 50 – 59: …………
   - 6 = 60 and above: ……....

2. Gender (sex):
   - 1 = Male: ………………...
   - 2 = Female: ………………

3. Marital status:
   - 1 = Single:…………………
   - 2 = Married: ……………..…..
   - 3 = Widow/widower : …….
   - 4 = Divorced: ……………..…
   - 5 = Cohabiting: …….…..…

4. Is farming your full-time occupation?
   - 1 = Yes: …………
   - 2 = No: ……………..……..

5. If 'NO' state your full-time occupation:
   - 1 = public servant: ……………….
   - 2 = technician/artisan: ………………
   - 3 = self employed/farmer: ……….
   - 4 = domestic worker/labourer: …......
   - 5 = Other: specify:……………….
   - 6 = Not applicable: …………………..

6. Which of the following monthly income grades applies to your monthly salary?
   - 1 = Below 500,00: …………….
   - 2 = R500,00 – R1 000,00: …….
   - 3 = R1 001,00 – R1 500,00: …..
   - 4 = R1 501,00 – R2 000,00: …..
   - 5 = R2 001,00 – R2 500,00: …..
   - 6 = R2 501,00 – R3 000,00: …..
   - 7 = R3 001,00 – R3 500,00: …..
   - 8 = R3 501,00 and above: …….

7. Highest academic qualification:
   - 1 = Std. 2 and below: ………....
   - 2 = Std. 3 – Std. 6: …………….
   - 3 = Std. 7 – Std. 9: …………….
   - 4 = Std. 10 (Matric): …………...
   - 5 = Post matric: ………………..

8. Trade skill(s)/profession:
   - 1 = None:….……………………..
   - 2 = Driving: ………………………
   - 3 = Artisan/Builder/Repairers: ….
   - 4 = Teacher/Nurse: ……………...
   - 5 = security: ……
   - 6 = Other: specify: ………………

9. Condition of health:
   - 1 = Excellent: …
   - 2 = Good: …
   - 3 = Fair: …
   - 4 = Poor: …

10. Indicate any other source(s) of monthly income and amount(s) by completing the table below:

Range of income		Petty trading	Building & construction	Manual labourer	Other: specify …………………
1	Below 500,00				
2	R500,00 – R1 000,00				
3	R1 001,00 – R1 500,00				
4	R1 501,00 – R2 000,00				
5	R2 001,00 – R2 500,00				
6	R2 501,00 – R3 000,00				
7	R3 001,00 – R3 500,00				
8	R3 501,00 and above				

B. HOUSEHOLD INFORMATION

11. Relationship to head of household:
    1 = Self: …………………………… 2 = Spouse: ………………………….…
    3 = Father/mother: ……………….. 4 = Sibling (brother, sister, etc.):….….…
    5 = Uncle/aunt: …………………… 6 = Grandfather/mother: ………………..
    7 = Other: specify: ………………..

12. Full time occupation of head of household:
    1 = Unemployed: ………………. 2 = Pensioner: ………………….
    3 = Trader:………………………. 4 = Teaching/police/nurse: …….
    5 = Artisan: ……………………..… 6 = Other: specify: ………………

13. Gender (sex) of head of household:
    1 = Male : …………… 2 = Female: …………

14. Total number of people in the household (cook, eat, and sleep) together.
    1 = 1 – 3: …… 2 = 4 – 6: ……
    3 = 7 – 9: …… 4 = 10 and more: …….

15. Number of children in the household:
    1 = none: ………. 2 = 1 - 3: ……………..…..
    3 = 4 - 6:……..…. 4 = 7 and more: ………

16. Number of household members receiving monthly wages/salary:
    1 = 1 : … 2 = 2: ….
    3 = 3: …. 4 = 4:….
    5 = 5 and more: …

17. Number of household members receiving social grants (e.g. old age pension, disability grant and child care grant)
    1 = 1 : … 2 = 2: ….
    3 = 3: …. 4 = 4:….
    5 = 5 and more: …

18. Number of household members with plot(s) at the Scheme:
    1 = 1 : … 2 = 2: ….
    3 = 3: …. 4 = 4:.….
    5 = 5 and more: …

19. Number of unemployed people in the household:
    1 = 1 : …　　　　2 = 2: ….
    3 = 3: ….　　　　4 = 4:…..
    5 = 5 and more: …

20. Number of household members working outside the district:
    1 = 1 : …　　　　2 = 2: ….
    3 = 3: ….　　　　4 = 4:….
    5 = 5 and more: …

21. Does your household receive remittances from relatives working outside the district?
    1 = Yes: …………　　　　2 = No: ……………..

22. Main source of your household food supply:
    1 = Household farming operation: ………　　　　2 = Community garden: ………
    3 = Buy food from the shops: ……………　　　　4 = Other: specify: …………….

23. How often does your household serve full meal (with meat/fish and vegetables)?
    1 = Daily: ……...........…　　　　2 = Each other day: …….
    3 = Weekly: …………....　　　　4 = Fortnightly: ………….
    5 = Monthly: ………..….　　　　6 = Other: specify: …..….

C. STANDARD OF HOUSING

24. Type of housing:
    1 = Traditional (rondavel): ……....　　　　2 = Semi-traditional: ………....
    3 = Brick & corrugated sheets: ….　　　　4 = Modern (with tile roof): …..

25. Number of rooms/huts occupied by your household:
    1 = 1 : …　　　　2 = 2: ….
    3 = 3: ….　　　　4 = 4:….
    5 = 5 and more: ……

26. Number of rooms/huts used for sleeping purpose:
    1 = 1 : …　　　　2 = 2: …..
    3 = 3: ….　　　　4 = 4: …..
    5 = 5 and more: ……

27. Which of the following appliance(s) does your household have?
    1 = Radio:……　　　　2 = Radio cassette recorder: ……
    3 = Music centre: …..　　　　4 = TV: ………
    5 = Video cassette recorder: ……　　　　6 = None: ……………

28. Does your household have electricity?
    1 = Yes: ……　　　　2 = No: ……

29. Type of fuel your household uses for cooking and heating:
    1 = gas:……………………….…
    2 = paraffin: …………………………..…...
    3 = firewood:……………….….…
    4 = electricity: …………………………..…
    5 = crop wastes/cow dung: ….
    6 = Other: specify: ……………………….

D. TRANSPORT AND COMMUNICATION

30. Which of the following forms of transport does your household have?
    1 = Horse/donkey/mule: …… 2 = Bicycle: …………………
    3 = Motorcycle:……………… 4 = Bakkie/Car/Truck: ……..
    5 = None: …………………....

31. How do you assess the roads linking your village/farm and the nearby centres (e.g. Queenstown and Cofimvaba)?
    1 = Excellent: …… 2 = Good: …….
    3 = Fair: ………… 4 = Poor: ……..

32. How do you assess the feeder roads linking your village/farm and the surrounding villages?
    1 = Excellent: …… 2 = Good: …….
    3 = Fair: ………… 4 = Poor: ……..

33. With what do you transport your farm produce?
    1 = Horse/donkey/mule: …… 2 = Bicycle: …………………
    3 = Motorcycle:……………… 4 = Bakkie/Car/Truck: ……..
    5 = Other: specify: ………….

34. Do you suffer any loss because of inadequate transport facilities?
    1 = Yes: ………… 2 = No: ……………..

35. Does your family have a telephone (land line)?
    1 = Yes: ………… 2 = No: ……………..

36. Does your community have public land line telephone(s)?
    1 = Yes: ………… 2 = No: ……………..

37. Does any member of your household have a cellular telephone?
    1 = Yes: ………… 2 = No: ……………..

E. HEALTH, WATER AND SANITATION

38. Is there any clinic in your community?
    1 = Yes: ………… 2 = No: ……………

39. If 'NO', does the mobile clinic visit the community?
    1 = Yes: ………… 2 = No: ……………..

40. How much does it cost to travel to the district's General Hospital?
    1 = R1,00 – R3,00 : …
    2 = R3,00 – R6,00: ….
    3 = R6,00 – R9,00: ….
    4 = R10,00 and more: …

41. The most common illness in your area:
    1 = high blood pressure: ….. 2 = diabetes: …...
    3 = Tuberculosis: …….. 4 = HIV/AIDS: …..
    5 = diarrhoea: …. 6 = Other: specify: …….

42. Sources of domestic water supply:
    1 = treated pipe borne water: …. 2 = river/canal: ……
    3 = spring: ………………………. 4 = borehole: ………
    5 = Other. Specify: ……………..

43. Is the source of water reliable?
    1 = Yes: ………… 2 = No: ……………..

44. Does your household treat (boil or add bleach to) drinking water?
    1 = Yes: ………… 2 = No: ……………..

45. What type of toilet facility does your household use?
    1 = water closet: …………. 2 = VIP latrine: ………
    3 = bucket system : ……… 4 = None : ……………

46. Does your community have public toilet facilities?
    1 = Yes: …………. 2 = No: ……………

47. Do the sanitation conditions in your community negatively affect the health of your household?
    1 = Yes: …………….. 2 = No: ……………..

F. PARTICIPATION IN THE IRRIGATION SCHEME

48. Where were you when the construction of the Scheme began?
    1 = Qamata/Cofimvaba District: …..
    2 = In Transkei but outside Cofimvaba District: …..
    3 = Outside Transkei but in South Africa (e.g. Johannesburg, Durban, etc.): …
    4 = Outside Transkei and South Africa: …….

49. What were you doing before joining the Scheme?
    1 = schooling: ……. 2 = dryland farming: …..
    3 = employee: ……. 4 = self-employed but not farming: ……
    5. Other: specify: …

50. How long have you been farming at the Scheme?
    1 = 1 – 3 years: …… 2 = 4 – 6 years: ……………..…
    3 = 7 – 9 years: …… 4 = 10 years and more: ……

51. Are you better off now than before you joined the Scheme?
    1. Yes: ……….. 2. No: ……….

52. Were the local people involved in the formulation and planning of the Scheme?
    1 = Yes: ……… 2 = No: ………
    3 = I do not know: …….

53. State the size of your plot:
    1 = less than 1 ha: …… 2 = 1 – 2 ha: ………..….
    3 = 3 – 4 ha: ………….. 4 = 5 ha and more: ……

54. Who is the ACTIVE farmer on the farm?
    1 = yourself: …………………..... 2 = your spouse: …………
    3 = your son/daughter: ………… 4 = farm manager: ……....
    5 = Other. Specify: …..

55. How did you get the plot?
    1 = inherited from parents-Title Deed:…..
    2 = inherited from parents-Tribal Land: …
    3 = rent from another household: …..
    4 = permission to occupy: ……..
    5 = share-cropping: ….
    6 = given by government through residential agreement: ….
    7 = Other. Specify: ………………………………………..

56. Do you use all your land for cultivation?
    1 = Yes: ………… 2 = No: ……………

57. If 'No', give a reason:
    1 = lack of capital: ………. 2 = lack of labour: …….
    3 = rented to others: ……. 4 = land is resting: ……
    5 = old age/sickness: …… 6 = Not applicable: …...

58. Are you satisfied with the size of your plot?
    1 = Yes: ……… 2 = No: ………

59. If 'No', what prevents you from getting more land?
    1 = lack of money: … 2 = unavailability of land: ……
    3 = community/law does not allow: …. 4 = Not applicable: ………..….

60. How do you describe the fertility of your soil?
    1 = high: … 2 = medium: …..….
    3 = low: .…. 4 = do not know: …

61. Name THREE main crops cultivated:
    1 = maize/potatoes/beans: …… 2 = maize/potatoes/cabbage: ……
    3 = maize/beans/lucerne: …..… 4 = maize/beans/pumpkins: …..…
    5 = maize/wheat/lucerne: …….

62. Are you free to decide which crop to plant and when to plant?
    1 = Yes: ………… 2 = No: ……………..

63. What do you use for ploughing your land?
    1 = Tractor: …. 2 = Animal power: …..
    3 = Manpower: ……….

64. Scale of operation:
    1 = Subsistence scale: ….. 2 = Commercial scale: ……

65. Do you have plot(s) for agriculture somewhere else?
    1 = Yes: …… 2 = No: …

66. Is farming at the Scheme more difficult than in the surrounding villages?
    1 = Yes: ………… 2 = No: ……………..

67. Name the farming facilities/resources you have at the Scheme that dryland farmers do not have:
    1 = water/tractors/extension service: …… 2 = water/extension service/inputs: ……
    3 = water only: …………………………….. 4 = water/fertilizer: ………………………

68. Which of the following soil conservation practices do you use?
    1 = Terracing: ……….. 2 = Contour ploughing: …………….
    3 = Crop rotation: ……. 4 = Other. Specify: …………………
    5 = None: …………….

69. Who supplies you with inputs (e.g. fertilizers, seeds, etc.)?
    1 = Agricultural cooperatives: …. 2 = Dept of Agriculture: ……………….
    3 = Shops and middlemen: …….. 4 = Relatives/fellow farmers/etc.: ..…
    5 = None: ………

70. Do you apply fertilizer(s) on your plot?
    1 = Yes: ……… 2 = No: ………

71. What method of weed control do you employ?
    1 = Manual (e.g. hoeing): …. 2 = Mechanical: …
    3 = Chemical: ………………. 4 = None:……..….

72. Is your method of weed control different from the one which was by the Scheme's management?
    1 = Yes: ………… 2 = No: ……………..

73. From whom did you learn farming skills?
    1 = Parents/relatives: …….
    2 = Fellow farmers: …..
    3 = Extension officers: …...
    4 = Training at the Scheme
    5 = Cooperative society: …
    6 = Nobody: ……
    7 = Other. Specify: ……….

74. How often do extension officers visit your farm?
    1 = Regularly: …..
    2 = Once a while:……
    3 = Not at all: ………

75. Do you pay for extension service?
    1 = Yes: ………… 2 = No: ……………..

76. Who do you consult more often for advice on your farming problems?
    1 = Headman: ……………..
    2 = Relatives/fellow farmers: …………..
    3 = Extension officers: …………………
    4 = Scheme supervisor:…………………
    5 = Cooperative society: ………………..…
    6 = Input suppliers: ……………………..…
    7 = Nobody: ………………..……………….
    8 = Other. Specify: ………………………

77. Does the lack of skills/experience limit your farm operations and production?
    1 = Yes: ………… 2 = No: ……………..

78. Do you control insects and pests on your plot?
    1 = Yes: ………… 2 = No: ………………

79. Please indicate your access to the following equipment.

Equipment	Privately owned
Tractor	1 = Yes: ……. 2 = No: …
Animal traction implements	1 = Yes: ……. 2 = No: …
Planter	1 = Yes: ……. 2 = No: …
Irrigation sprinklers/pipes	1 = Yes: ……. 2 = No: …
Irrigation pump	1 = Yes: ……. 2 = No: …
Bakkie	1 = Yes: ……. 2 = No: …

80. The single most important factor currently affecting your operation?
    1 = Price uncertainty of produce: …… 2 = Low producer price: ………
    3 = Climate: …………………………… 4 = Production cost:……………
    5 = Safety: …………………………….. 6 = Other. Specify: ……………

81. Which of the following operations are limited by access to or maintenance level of equipment?

Operation	Equipment limiting operation
Land preparation	
Irrigation	
Planting	
Harvesting	
Marketing	
Other. Specify: ……………………	

82. How do you see your farming activities in the next 5 years?
    1 = production will be higher: …….. 2 = production will be the same: ….
    3 = production will be lower: ……… 4 = will not be farming any more: …

83. What is the approximate TOTAL ANNUAL TURNOVER of all your farming activities?
    1 = Less than R5 000,00 : ……….. 2 = R5 000,00 – R9 999,00 :………
    3 = R10 000,00 – R14 999,00 : ….. 4 = R15 000,00 – R19 999,00 : …..
    5 = R20 000,00 – R24 999,00 : ….. 6 = R25 000,00 – R29 999,00 : …..
    7 = More than R30 000,00 : ………

84. Would you accept a job offer with the same income in an urban area?
    1 = Yes: ………… 2 = No: ……………..

85. Do you think your children would want to carry on farming in your community?
    1 = Yes: ………… 2 = No: ……………..

G. ROLE OF THE STATE AND PRIVATE INSTITUTIONS

86. Government departments/institutions which assist farmers at the Scheme.
    1 = Dept. of Agriculture/Land Affairs/Water Affairs: ……..
    2 = Chris Hani District Municipality/Dept. of Agriculture: …..
    3 = Chris Hani District Municipality/Eastern Cape Development Corporation: ….
    4 = Other: specify: …..
    5 = None: …….

87. What type of assistance do you receive from state institutions/government departments?
 1 = Credit facilities: ………………….. 2 = Inputs (seeds, fertilizers, etc.): …..
 3 = Advice and extension service: … 4 = Marketing facilities: ………………..
 5 = Other. Specify: ………………….. 6 = None: ……………………………….

88. Do you pay for the assistance offered by state institutions/government departments?
 1 = Yes: ………………… 2 = No: ……….
 3 = Not applicable: …….

89. NGOs/cooperatives which assist farmers at the Scheme.
 1 = Farmers Support Centre: ……
 2 = Farm Africa: ……
 3 = Farmers Support Centre/ Farm Africa: ……
 4 = Kula: ……
 5 = Other: specify: ……
 6 = None: ……

90. Do you belong to any agricultural cooperative society?
 1 = Yes: ………..… 2 = No: ……………

91. What type of assistance do you receive from your cooperative society?
 1 = Credit facilities: …………………. 2 = Inputs (e.g. fertilizers, etc.): …..
 3 = Advice and extension service: … 4 = Marketing facilities: ………..…..
 5 = Other. Specify: ………………….. 6 = None: ……………………………

92. Do you pay for the assistance offered by your cooperative society?
 1 = Yes: ……….. 2 = No: ………. 3 = Not applicable: …….

93. When was your cooperative society formed?
 1 = Before the Scheme was established: …..
 2 = After the Scheme was established: …….
 3 = Not applicable: …….

94. Was there any cooperative society in Qamata area before the Scheme?
 1 = Yes: ……….. 2 = No: ………. 3 = I do not know: …..

H. CREDIT FACILITIES

95. Do you operate any banking account for your farming activities?
 1 = Yes: ………… 2 = No: ……………..

96. Where is the bank/building society?
 1 = Qamata: …………..… 2 = Cofimvaba: ………………………..…
 3 = Queenstown: ………. 4 = Other: specify: ……………………..
 5 = Not applicable: ……..

97. Where do you get credit(s) to run your farm operations?
 1 = Bank/building Society: ………...…. 2 = Agricultural cooperative society:..…
 3 = Local moneylenders/cash loans: … 4 = Relatives/friends/neighbours: …..…
 5 = Other: specify: ………………………. 6 = None: ………………………………

98. Indicate the kind of loans/credits you usually take.
1 = Short-term: ……. 2 = Medium-term: …….
3 = Long-term: ……. 4 = Not applicable: ……

99. Indicate the rate of interest you pay for loans/credits you take.
1 = High: ………………… 2 = Medium: ……………..
3 = Low: …………………. 4 = Not applicable: ………

100. Which of the following best describes your debt burden?
1 = Increased in recent years: …… 2 = Decreased in recent years: ….….
3 = Remained the same: ………..… 4 = Not applicable: ……………………

101. Have you borrowed money within the last 12 months?
1 = Yes: ………… 2 = No: ……………..

102. If 'No', please give a reason:
1 = No need: ………………………… 2 = High interest rate: ………………
3 = Cannot afford to repay:………… 4 = Rely on personal savings:……...
5 = No collateral :…………………… 6 = Not applicable: …………………..

103. Do you think the farmers at the Scheme have more debts than the dryland farmers?
1 = Yes: ………… 2 = No: ……………..

104. Indicate the most important effect of the withdrawal of government support.
1 = difficult to sell produce: …………… 2 = shortage tractors and equipment: …
3 = shortage of credit: ………………….. 4 = reduced extension service: ………..

I. MARKETING

105. How do you dispose of your farm produce?
1 = By cash sale: ……………………… 2 = By barter: ……….........................
3 = Consumed by the household: …... 4 = Other: specify: ……………………

106. Is there any central purchasing unit that buys your produce?
1 = Yes: ………… 2 = No: ……………..

107. Does the unit offer fixed prices for your produce?
1 = Yes: ……….. 2 = No: ………. 3 = Not applicable: …………..

108. Is the market for your produce reliable?
1=Yes: ……….. 2 = No: ……….

109. Do you keep records of farm transactions?
1= Yes: ……….. 2 = No: ……….

110. If 'Yes', how did you acquire the bookkeeping skills?
1 = Formal training at an institution: ….. 2 = Training at the Scheme: ……………
3 = Extension officers: ………………… 4 = Cooperative society: ………………..
5 = Not applicable 6 = Other. Specify: ………………………

THANK YOU!!!

APPENDIX 2

QUESTIONNAIRE FOR DRYLAND FARMERS

This survey is concerned with the transfer of irrigation technology and rural development in the Qamata area. It covers a wide range of social, political and economic issues.

The aim of this investigation is to solicit information that would enable:

1. the researcher to write a thesis for the degree of Doctor of Philosophy; and,
2. institutions engaged in rural development to direct their actions in a meaningful way.

Accurate information about Qamata area is important in this survey. It would therefore be appreciated if you could answer all the questions accurately.

Your name does not appear anywhere in the questionnaire. In addition, you do not have to sign the questionnaire or any other document. You remain entirely anonymous.

ENUMERATOR: …………………………………………… DATE: …………………...
ADMINISTRATIVE AREA: ……………………………. VILLAGE: ……………….

**NB: Please mark with X next to the most appropriate answer in the spaces provided.*

A. PERSONAL INFORMATION

1. Age:
    1. Under 20 years: …..
    2. 20 – 29: …..
    3. 30 – 39: …..
    4. 40 – 49: …..
    5. 50 – 59: …..
    6. 60 and above: …..
2. Gender (sex): 1. Male: ……………….... 2. Female: ………………
3. Marital status: 1. Single:………………… 2. Married : …………….. 3. Widow/widower : …… 4. Divorced: ………….…… 5. Cohabiting: ………..…
4. Is farming your full-time occupation?
    1. Yes: ………… 2. No: ……………..
5. If 'No' state your full-time occupation:
    1 = public servant: ………………. 2 = technician/artisan: ………………
    3 = self employed/farmer: ………. 4 = domestic worker/laborer: …...…..
    5 = Other: specify:………………. 6 = Not applicable: ……………….…
6. Which of the following monthly income grades applies to your monthly salary?
    1. Below 500,00: …..
    2. R500,00 – R1 000,00: …..
    3. R1 001,00 – R1 500,00: …..
    4. R1 501,00 – R2 000,00: …..
    5. R2 001,00 – R2 500,00: …..
    6. R2 501,00 – R3 000,00: …..
    7. R3 001,00 – R3 500,00: …..
    8. R3 501,00 and above: …..
7. Highest academic qualification:
    1. Std. 2 and below: …..
    2. Std. 3 – Std. 6: …..
    3. Std. 7 – Std. 9: …..
    4. Std. 10 (Matric) : …..
    5. Post matric: …..
8. Trade skill(s)/professional qualification(s)
    1 = none:….. 2 = Driving: …… 3 = Artisan/builders/all forms of repairers: …..
    4 = teacher/nurse: … 5 = security: …… 6 = Other: specify: ……………
9. Condition of health:
    1. Excellent: …….. 2. Good: ……….. 3. Fair: …………… 4. Poor: …………

10. Indicate any other source(s) of monthly income and amount(s) by completing the table below:

	Range of income	Petty trading	Building & construction	Manual labourer	Other: specify …………………
1	Below 500,00				
2	R500,00 – R1 000,00				
3	R1 001,00 – R1 500,00				
4	R1 501,00 – R2 000,00				
5	R2 001,00 – R2 500,00				
6	R2 501,00 – R3 000,00				
7	R3 001,00 – R3 500,00				
8	R3 501,00 and above				

B. HOUSEHOLD INFORMATION

11. Relationship to head of household:
    1. Self: ……………………………………..
    2. Spouse: ………………………………….
    3. Father/mother: ………………………….
    4. Sibling (brother, sister, cousin): ………..
    5. Uncle/aunt: ……………………………..
    6. Grandfather/mother: ……………………
    7. Other: specify: …………………………

12. Full time occupation of head of household:
    1 = Unemployed: ……. 2 = Pensioner: ..…
    3 = Trader:…………… 4 = Teaching/police/nurse: ….
    5 = Artisan: ………..… 6 = Other: specify: ………………

13. Gender (sex) of head of household: 1. Male : ……….. 2. Female: …………

14. Total number of people in the household (cook, eat, and sleep) together:
    1 = 1 – 3: … 2 = 4 – 6: ……
    3 = 7 – 9: …… 4 = 10 and more: …….

15. Number of children in the household:
    1 = 1 – 3: … 2 = 4 – 6: ……
    3 = 7 – 9: …… 4 = 10 and more: …….

16. Number of household members receiving monthly wages/salary:
    1 = 1 : … 2 = 2: …. 3 = 3: …. 4 = 4:…. 5 = 5 and more: …

17. No. of household members receiving social grants (e.g. old age pension, disability grant and child care grant:
    1 = 1 : … 2 = 2: …. 3 = 3: …. 4 = 4:…. 5 = 5 and more: …

18. Number of household members with plot(s) at the Scheme:
    1 = 1 : … 2 = 2: …. 3 = 3: …. 4 = 4:…. 5 = 5 and more: …

19. Number of unemployed people in the household:
    1 = 1: … 2 = 2: …. 3 = 3: …. 4 = 4… 5 = 5 and more: …
20. Number of household members working outside the district:
    1 = 1: … 2 = 2: …. 3 = 3: …. 4 = 4… 5 = 5 and more: …
21. Does your household receive remittances from relatives working outside the district? 1 = Yes : ………… 2 = No: ……………
22. Main source of your household food supply:
    1 = Household farming operation: ………… 2 = Community garden: ………
    3 = Buy food from the shops: ……………… 4 = Other: specify: …………….
23. How often does your household serve full meal (i.e. with meat/fish and vegetables)?
    1 = Daily: ……..…. 2 = Each other day: ……. 3 = Weekly: ………....
    4 = Fortnightly: …. 5 = Monthly: ………..…. 6 = Other: specify: ….

C. STANDARD OF HOUSING

24. Type of housing:
    1 = Traditional (rondavel): ……. 2 = Semi-traditional: …..
    3 = Brick & corrugated sheets: … 4 = Modern (with tile roof): …..
25. Number of rooms/huts occupied by your household:
    1 = 1 : … 2 = 2: …. 3 = 3: …. 4 = 4:…. 5 = 5 and more: …
26. Number of rooms/huts used for sleeping purpose:
    1 = 1 : … 2 = 2: …. 3 = 3: …. 4 = 4:…. 5 = 5 and more: …
27. Which of the following appliance(s) does your household have?
    1. Radio:…… 2. Radio cassette recorder: …… 3. Music centre: ….
    4. TV: ……… 5. Video cassette recorder: …… 6. None: …………..
28. Does your household have electricity? 1 = Yes: ………… 2 = No: …………
29. Type of fuel your household uses for cooking and heating:
    1 = gas:…. 2 = paraffin: …... 3 = firewood:…..
    4 = electricity: … 5 = crop wastes/cow dung: …. 6 = Other: specify: …….

D. TRANSPORT AND COMMUNICATION

30. Which of the following forms of transport does your household have?
    1 = Horse/donkey/mule: …… 2 = Bicycle: …… 3 = Motorcycle:…….
    4 = Bakkie/Car/Truck: …….. 5 = None: ……..
31. How do you assess the roads linking your village/farm and the nearby centres (e.g. Queenstown and Cofimvaba)?
    1 = Excellent: …… 2 = Good: …. 3 = Fair: …… 4 = Poor: ……..
32. How do you assess the feeder roads linking your village/farm and the surrounding villages? 1 = Excellent: ……2 = Good: …. 3 = Fair: …… 4 = Poor: ……..
33. With what do you transport your farm produce?
    1 = Horse/donkey/mule: …… 2 = Bicycle: …… 3 = Motorcycle:…….
    4 = Bakkie/Car/Truck: …….. 5 = Carrying on the head: ….
34. Do you suffer any loss because of inadequate transport facilities?
    1 = Yes: …. 2 = No: ….

35. Does your family have a telephone (land line)? 1 = Yes: …. 2 = No: ….

36. Does your community have public land line telephone(s)? 1 = Yes: … 2 = No: ….

37. Does any member of your household have a cellular telephone?
1 = Yes: …. 2 = No: ….

E. HEALTH, WATER AND SANITATION

38. Is there any clinic in your community? 1 = Yes: …. 2 = No: ….

39. If 'No', does the mobile clinic visit the community? 1 = Yes: …. 2 = No: ….

40. How much does it cost to travel to the district's General Hospital?
1 = R1,00 – R3,00 : … 2 = R3,00 – R6,00: ….
3 = R6,00 – R9,00: …. 4 = R10,00 and more: …

41. The most common illness in your area.
1 = high blood pressure: ….. 2 = diabetes: …... 3 = Tuberculosis: …..
4 = HIV/AIDS: ….. 5 = diarrhoea: …. 6 = Other: specify: …….

42. Sources of domestic water supply:
1 = treated pipe borne water: …. 2 = river: …… 3 = spring: ….
4 = borehole: ……… 5 = Other. Specify: ……………………

43. Is the source of water reliable? 1 = Yes: …. 2 = No: ….

44. Does your household treat (boil or add bleach to) drinking water?
1 = Yes: …. 2 = No: ….

45. What type of toilet facility does your household use?
1 = water closet: …. 2 = VIP (ventilated improved pit) latrine: …………
3 = bucket system 4 = None

46. Does your community have public toilet facilities? 1. Yes: …. 2. No: ….

47. Do the sanitation conditions in your community negatively affect the health of your household? 1. Yes: …. 2. No: ….

F. FARMING AND RESOURCES

48. What were you doing before taking up farming in this community?
1 = schooling: …… 2 = dryland farming: …..
3 = employee: ……. 4 = self-employed but not farming: ……
5 = Other: specify: ……………………

49. How long have you been farming in this community?
1 = 1 – 3 years: …… 2 = 4 – 6 years: ……
3 = 7 – 9 years: …… 4 = 10 years and more: ……

50. Are you better off now? 1 = Yes: ……….. 2 = No: ………

51. Who is the ACTIVE farmer on the farm?
1 = yourself: …. 2 = your spouse: ….
3 = your son/daughter: ………… 4 = farm manager: ….
5 = Other. Specify: …..................

52. How did you get the plot?
    1 = inherited from parents-Title Deed:…..
    2 = inherited from parents-Tribal Land: …
    3 = rent from another household: …..
    4 = permission to occupy: ……..
    5 = share-cropping: ….
    6. given by government through residential agreement: ….
    7 = Other. Specify: …..

53. Do you use the land for cultivation? 1 = Yes: ……….. 2 = No: ……….

54. If 'No', give a reason:
    1 = lack of capital: …. 2 = lack of labour: …. 3. rented to others: ….
    4 = land is resting: …… 5 = old age/sickness: …… 6 = Not applicable: …..

55. Are you satisfied with the size of your plot? 1 = Yes: ……….. 2 = No: ……….

56. If 'No', what prevents you from getting more land?
    1 = lack of money: … 2 = unavailability of land: ……
    3 = community/law does not allow: …. 4 = Not applicable: ……

57. How do you describe the fertility of your soil?
    1 = high: … 2 = medium: …… 3 = low: … 4 = do not know: …

58. Name THREE main crops cultivated:
    1 = maize/potatoes/beans: …… 2 = maize/potatoes/cabbage: ……
    3 = maize/beans/lucerne: …..… 4 = maize/beans/pumpkins: ……..
    5 = maize/wheat/lucerne: …….

59. Are you free to decide which crop to plant and when to plant?
    1 = Yes: ……….. 2 = No: ……….

60. Do you wish to have a plot at the scheme? 1 = Yes: ……….. 2 = No: ……….

61. What do you use for ploughing your land?
    1 = Tractor: …. 2 = Animal power: ….. 3 = Manpower: ……….

62. Scale of operation: 1 = Subsistence scale: ….. 2 = Commercial scale: ……

63. Name the farming facilities/resources you have that your counterparts at the Scheme do not have.
    1 = tractors/extension service: …… 2 = extension service/inputs: ……
    3 = political support: …… 4 = None: ……

64. Do you have another plot for agriculture somewhere else?
    1 = Yes: ……….. 2 = No: ……….

65. Is farming in your community more difficult than at the scheme?
    1 = Yes: ……….. 2 = No: ……….

66. Which of the following soil conservation practices do you use?
    1 = Terracing: ….. 2 = Contour ploughing: ….
    3 = Crop rotation: ……. 4 = Other. Specify: ……… 5 = None: ………

67. Who supplies you with inputs?
    1 = Agricultural cooperatives: …. 2 = Dept of Agriculture: …….
    3 = Shops and middlemen: …….. 4 = Relatives/fellow farmers/neighbours: …
    5 = None: ………

68. Do you apply fertilizer(s) on your plot? 1 = Yes: ……….. 2 = No: ……….
69. What method of weed control do you employ?
    1 = Manual (e.g. hoeing): …. 2 = Mechanical: …
    3 = Chemical: …… 4 = None: ……
70. Have you ever worked on a white owned farm? 1 = Yes: ……… 2 = No: ..…
71. From whom did you learn your farming skills?
    1 = Parents/relatives: ….. 2 = Fellow farmers: …..
    3 = Extension officers: …. 4 = Training at the Scheme: ……
    5 = Cooperative society: … 7 = Nobody: ……
    8 = Other. Specify: …………………………………..
72. How often do extension officers visit your farm?
    1 = Regularly: ….. 2 = Once a while:…… 3 = Not at all: ………
73. Do you pay for extension service? 1 = Yes: ……….. 2 = No: ……….
74. Who do you consult more often for advice on your farming problems?
    1= Headman: ….. 2 = Relatives/fellow farmers: …..
    3 = Extension officers: …. 4 = Scheme supervisor:…
    5 = Cooperative society: … 6 = Input suppliers: …….
    7 = Nobody: …… 8 = Other. Specify:
    …………………………………
75. Does the lack of skills/experience ever limit your farm operations and production?
    1 = Yes: ……….. 2 = No: ……….
76. Do you control insects and pests on your plot?
    1 = Yes: ……….. 2 = No: ……….
77. Please indicate your access to the following equipment.

Equipment	Privately owned
Tractor and cultivation implements	1 = Yes: ….. 2 = No: ……
Animal traction implements	1 = Yes: ….. 2 = No: ……
Planter	1 = Yes: ….. 2 = No: ……
Bakkie	1 = Yes: ….. 2 = No: ……

78. Which of the following operations are limited by access to or maintenance level of equipments?

Operation	Equipment limiting operation
Land preparation	
Planting	
Harvesting	
Marketing	
Other. Specify: ……………………	

79. What do you consider as the single most important factor currently affecting your operation?
    1 = Price uncertainty of produce: …… 2 = Low producer price: ………
    3 = Climate: …………… 4 = General production cost (cost of inputs): ………
    5 = Safety: ……….. 6 = Other. Specify: …………………………

80. How do you see your farming operation in the next 5 years?
    1 = Production will be higher: …. 2 = Production will be the same: ….
    3 = Production will be lower: …. 4 = Will not be farming any more: ….

81. What is the approximate TOTAL ANNUAL TURNOVER of all your farming activities?
    1 = Less than R5 000,00: …..
    2 = R5 000,00 – R9 999,00: …..
    3 = R10 000,00 – R14 999,00: …..
    4 = R15 000,00 – R19 999,00: …..
    5 = R20 000,00 – R24 999,00: …..
    6 = R25 000,00 – R29 999,00: …..
    7 = More than R30 000,00: …..

82. Would you accept a job offer with the same income in an urban area?
    1 = Yes: ……….. 2 = No: ……….

83. Do you think your children would want to carry on farming in your community?
    1 = Yes: ……….. 2 = No: ……….

G. ROLE OF THE STATE AND PRIVATE INSTITUTIONS

84. Government departments/institutions which assist farmers in the community.
    1 = Dept. of Agriculture/Land Affairs/Water Affairs: ……..
    2 = Chris Hani District Municipality/Dept. of Agriculture: …..
    3 = Chris Hani District Municipality/Eastern Cape Development Corporation: ….
    4 = Other: specify: …..
    5 = None: …….

85. What type of assistance do you receive from state institutions/government departments?
    1 = Credit facilities: ….. 2 = Inputs (e.g. seeds, fertilizers, etc.): …..
    3 = Advice and extension service: … 4 = Marketing facilities: …..
    5 = Other. Specify: ……………….. 6 = None: ………

86. Do you pay for the assistance offered by state institutions/government departments?
    1 = Yes: ……….. 2 = No: ………. 3 = Not applicable: …….

87. NGOs/cooperatives which assist farmers in your community.
    1 = Farmers Support Centre: ……
    2 = Farm Africa: ……
    3 = Farmers Support Centre/ Farm Africa: ……
    4 = Kula: ……
    5 = Other: specify: …… 6 = None: ……

88. Do you belong to any agricultural cooperative society?
    1 = Yes: ……….. 2 = No: ……….

89. What type of assistance do you receive from your cooperative society?
    1 = Credit facilities: ….. 2 = Inputs (e.g. seeds, etc.): …..
    3 = Advice and extension service: … 4 = Marketing facilities: …..
    5 = Other. Specify: ……………….. 6 = None: ………

90. Do you pay for the assistance offered by your cooperative society?
    1 = Yes: ……….. 2 = No: ………. 3 = Not applicable: …….

91. When was your cooperative society formed?
    1 = Before the Scheme was established : …..
    2 = After the Scheme was established: ……. 3 = Not applicable
92. Was there any cooperative society in Qamata area before the Scheme?
    1 = Yes: ……….. 2 = No: ………. 3 = I do not know: …..

H. CREDIT FACILITIES

93. Do you operate any banking account for your farming activities?
    1 = Yes: ……….. 2 = No: ……….
94. Where is the bank/building society?
    1 = Qamata: ………..…
    2 = Cofimvaba: ………....
    3 = Queenstown: ……….
    4 = Other: specify: ………………………………….
    5 = Not applicable: ……..
95. Where do you get credit(s) to run your farm operations?
    1 = Bank/building Society: ………………...
    2 = Agricultural cooperative society: ……....
    3 = Local moneylenders/cash loans: ……….
    4 = Relatives/friends/neighbours: ………….
    5 = Other: specify: ………………………....
    6 = None: …………………………………..
96. Indicate the kind of loans/credits you usually take.
    1 = Short-term: …….
    2 = Medium-term: …
    3 = Long-term: …….
    4 = Not applicable
97. Indicate the rate of interest you pay for loans/credits you take.
    1 = High: …………………
    2 = Medium: ……………..
    3 = Low: …………………
    4 = Not applicable: ………
98. Which of the following best describes your debt burden?
    1 = Increased in recent years: ………………
    2 = Decreased in recent years: ……………...
    3 = Remained the same in recent years: ……
    4 = Not applicable: ………………………
99. Have you borrowed money within the last 12 months?
    1 = Yes: ……….. 2 = No: ……….
100. If 'No', please give a reason:
    1 = No need: …………………………………….
    2 = High interest rate: ……………………......
    3 = Cannot afford to repay:……………………..
    4 = Rely on personal savings:…………………......
    5 = No collateral (security against default):…..…
    6 = Not applicable: ………………………………

I. MARKETING

101. How do you dispose of your farm produce?
1 = By cash sale: ……………… 2 = By barter: ……….................
3 = Consumed by the household: …… 4 = Other: specify: ………………

102. Is there any central purchasing unit that buys your produce?
1 = Yes: ……….. 2 = No: ……….

103. Does the unit offer fixed prices for your produce?
1 = Yes: ……….. 2 = No: ………. 3 = Not applicable: …………..

104. Is the market for your produce reliable? 1 = Yes: ……….. 2 = No: ……….

105. Do you keep records of farm transactions? 1 = Yes: ……….. 2 = No: ……….

106. If 'Yes', how did you acquire the bookkeeping skills?
1 = Formal training at an education institution: …
2 = Training at the Scheme: …
3 = Extension officers: ….
4 = Cooperative society: …
5 = Not applicable: …
6 = Other. Specify: ……………………………………..

THANK YOU!!!

APPENDIX 3

QUESTIONNAIRE FOR EXTENSION OFFICERS AT QAMATA IRRIGATION SCHEME

This survey is concerned with the transfer of irrigation technology and rural development in the Qamata area. It covers a wide range of social, political and economic issues.

The aim of this investigation is to solicit information that would enable:

1. the researcher to write a thesis for the degree of Doctor of Philosophy; and,
2. institutions engaged in rural development to direct their actions in a meaningful way.

Accurate information about Qamata area is important in this survey. It would therefore be appreciated if you could answer all the questions accurately.

Your name does not appear anywhere in the questionnaire. In addition, you do not have to sign the questionnaire or any other document. You remain entirely anonymous.

ENUMERATOR: …………………………………………… DATE: ………………
ADMINISTRATIVE AREA: ……………………………… VILLAGE: ……………

**NB: Please mark with X next to the most appropriate answer in the spaces provided.*

1. Are you from Qamata area? 1 = Yes: …… 2 = No: ……
2. Your designation at the Scheme:
   1 = Supervisor: …… 2 = Manager: …..
   3 = Extension Officer: …… 4 = Other: specify: ……………….
3. Age:
   1 = Under 20:….
   2 = 20-29:….
   3 = 30-39:….
   4 = 40-49:….
   5 = 50-59:….
   6 = 60 years and above:……
4. Sex: 1 = Male:…. 2 = Female:….
5. To which Section do you belong?
   1 = Section 1:…. 2 = Section 2:…. 3 = Section 3:….
   4 = Section 4:…. 5 = Section 5:…. 6 = Section 6:….
6. How long have you been working at Qamata Irrigation Scheme?
   1 = 1 – 3 years: ……
   2 = 4 – 6 years: ……
   3 = 7 – 9 years: ……
   4 = 10 years and more: ……
7. Does the community benefit from the Scheme?
   1 = Yes: …….. 2 = No: …………
8. Which government departments/institutions assist farmers at the Scheme?
   1 = Dept. of Agriculture/Land Affairs/Water Affairs: ……..
   2 = Chris Hani District Municipality/Dept. of Agriculture: …..
   3 = Chris Hani District Municipality/Eastern Cape Development Corporation: …..
   4 = Other: specify: …..
   5 = None: …….
9. Indicate the type of the assistance these departments/institutions offer the farmers:
   1 = Credit facilities: ….. 2 = Inputs (e.g. seeds, etc.): …..
   3 = Advice and extension service: … 4 = Marketing facilities: …..
   5 = Other. Specify: ……………….. 6 = None: ………
10. Do the farmers pay for these services?
    1 = Yes: …….. 2 = No: …………
11. NGOs/cooperatives which assist farmers at the Scheme.
    1 = Farmers Support Centre: ……
    2 = Farm Africa: ……
    3 = Farmers Support Centre/ Farm Africa: ……
    4 = Kula: ……
    5 = Other: specify: ……
    6 = None: ……

12. What type of assistance do the farmers receive from cooperative societies?
    1 = Credit facilities: …..
    2 = Inputs (e.g. seeds, fertilizers, etc.): …..
    3 = Advice and extension service: …
    4 = Marketing facilities: …..
    5 = Other. Specify: ………………..
    6 = None: ………
13. Do the farmers pay for these services? 1 = Yes: …….. 2 = No: …………
14. How do you assess the farming methods of the farmers at the Scheme?
    1 = Modern: ………
    2 = Traditional: …..
    3 = Mixture of modern and traditional methods: ……..
15. Do the farmers show interest in the extension services you provide?
    1 = Yes: …….. 2 = No: ………
16. How often do you interact with the farmers?
    1 = weekly:…….. 2 = fortnightly: …… 3 = monthly: …….
    4 = quarterly: ….. 5 = in times of crises: …..
17. Do you think that the methods the farmers are using have been influenced by the Scheme's management and extension services? 1 = Yes: …….. 2 = No: ………
18. Are you satisfied with the quantity and quality of agricultural production at the Scheme? 1 = Yes: …….. 2 = No: …………
19. What is the prospect of agricultural production at the Scheme in the next 5 years?
    1 = production will be higher: ………. 2 = production will remain the same: ….
    3 = production will be lower: ……….. 4 = many farmers will leave the Scheme: ...
    5 = more farmers will join the Scheme: …..
20. Why do some farmers not plough their entire plots?
    1 = lack of equipment: ….. 2 = lack of skills: …….
    3 = lack of support services: …. 4 = inadequate extension services: …..
21. How do you assess the living standards of the farmers at the Scheme?
    1 = higher than dryland farmers: ……
    2 = worse than dryland farmers: …….
    3 = no significant difference between the two: ….
22. Are the irrigation farmers better of now than the period before the Scheme's establishment? 1 = Yes: …….. 2 = No: …………
23. Are some farmers leaving the Scheme to find jobs elsewhere?
    1 = Yes: …….. 2 = No: …………
24. Have the farmers had enough training to manage the irrigation scheme all by themselves? 1 = Yes: …….. 2 = No: …………
25. Do you think the people who planned the Scheme understood the problems, values and aspirations of the people in Qamata area? 1 = Yes: …….. 2 = No: ……
26. Are the farmers involved in the management and planning of activities at the Scheme?
    1 = Yes: …….. 2 = No: …………
27. Do local chiefs/headmen have any influence on land distribution at the Scheme?
    1 = Yes: …….. 2 = No: …………

28. Which of the following statements about the crime rate in the area do you think is correct?
    1 = has increased in recent years because of the Scheme: ………
    2 = has decreased in recent years because of the Scheme: ………
    3 = has not change significantly to deserve attention: ………

29. In your opinion, has the Scheme been able to bring social change in Qamata area?
    1 = Yes: …….. 2 = No: …………

30. Has the Scheme reduced poverty in the Qamata area? 1 = Yes: …….. 2 = No: ………

31. Has the Scheme been able to reduce unemployment in the Qamata area?
    1 = Yes: ………… 2 = No: ………..

32. Can the Qamata Tribal Authority establish similar scheme elsewhere in the tribal area? 1 = Yes: ………… 2 = No: ………..

33. Is there any need for the development of other activities in Qamata area? (e. g. Agro-based manufacturing industries)? 1 = Yes: ………. 2 = No: ……………

34. Do you think the people in this area will be prepared to participate in such development? 1 = Yes: ……. 2 = No: ……..

35. Do you think the local resources (manpower, finance, institution, raw materials, etc.) can support such development? 1 = Yes: ……… 2 = No: ……

36. Which of the following statements about the people's attitude towards culture, custom and tradition in the area do you think is correct?
    1 = shows respect: ………..
    2 = attitude undermines the culture, custom and tradition: ………..
    3 = I do not know: ………..

THANK YOU!!!

APPENDIX 4

QUESTIONNAIRE FOR TRADITIONAL LEADERS IN QAMATA AREA

This survey is concerned with the transfer of irrigation technology and rural development in the Qamata area. It covers a wide range of social, political and economic issues.

The aim of this investigation is to solicit information that would enable:

1. the researcher to write a thesis for the degree of Doctor of Philosophy; and,
2. institutions engaged in rural development to direct their actions in a meaningful way.

Accurate information about Qamata area is important in this survey. It would therefore be appreciated if you could answer all the questions accurately.

Your name does not appear anywhere in the questionnaire. In addition, you do not have to sign the questionnaire or any other document. You remain entirely anonymous.

ENUMERATOR: ………………………………………… DATE: ………………

ADMINISTRATIVE AREA: ……………………………… VILLAGE: ……………

NB: Please mark with X next to the most appropriate answer in the spaces provided.

1. Designation:
   1 = King: …. 2 = Deputy King: …. 3 = Chief: ….
   4 = Sub Chief: …. 5 = Headman: …. 6 = Other: specify: …………
2. Where were you when the construction of the Scheme began?
   1 = Qamata/Cofimvaba District: …..
   2 = In Transkei but outside Cofimvaba District: …..
   3 = Outside Transkei but in South Africa (e.g. Johannesburg, etc.): ……..
   4 = Outside Transkei and South Africa (e.g. Zambia, etc): …….
3. Who decided to establish the Scheme?
   1 = The people of Qamata: …. 2 = Western Thembuland Traditional Authority: …
   3 = St. Marks District Council: …. 4 = Government: ….
4. Were the intended beneficiaries consulted at the project definition and planning stages? 1 = Yes: …. 2 = No: ….
5. Were the traditional leaders\headmen consulted? 1 = Yes: …. 2 = No: ….
6. If "YES", who consulted you?
   1 = Dept of Native Administration: ………
   2 = Dept. of agriculture: ………
   3 = Managing consultants of the proposed Scheme: ………
   4 = Other: specify: ………………….. 5 = Not applicable: ………
7. What was the consultation about?
   1 = to inform the community about government's intention to establish irrigation project in the area: ………
   2 = to discuss what the people really needed to alleviate poverty: ………
   3 = to ask for support and cooperation for the irrigation scheme: ………
   4 = to spell out duties and responsibilities: ………
8. Do you think that the people who planned the Scheme understood of the problems, values and aspirations of the people of Qamata? 1 = Yes: …… 2 = No: ……
9. Has the Scheme contributed towards the improvement of the living conditions of the people? 1 = Yes: …….. 2 = No: …………
10. Has the Scheme attracted many businesses to the Qamata area?
    1 = Yes: …….. 2 = No: …………
11. Are the youth no longer going to the cities to look for jobs because of the Scheme?
    1 = Yes: …….. 2 = No: …………
12. Has the scheme contributed towards the reduction of poverty in the area?
    1 = Yes: ………… 2 = No: ………..
13. Has the Scheme been able to reduce unemployment in the Qamata area?
    1 = Yes: ………… 2 = No: ………..
14. Has the Scheme contributed towards the improvement of farming techniques of the irrigation farmers? 1 = Yes: ………… 2 = No: ………..

15. Have the dryland farmers outside the Scheme adopted some of the new farming techniques? 1 = Yes: ………… 2 = No: ………..

16. Can the Qamata Tribal Authority establish similar scheme elsewhere in the tribal area? 1 = Yes: ………… 2 = No: ………..

17. As a leader, have you noticed any change in the population as the result of the establishment of the Scheme? 1 = Yes: ………… 2 = No: ………..

18. What has happened to the size of the population?
    1 = has increased: …… 2 = has decreased: …… 3 = has not changed: ……

19. Are there more females than males in the population?
    1 = Yes: ………… 2 = No: ………..

20. Are there more 'foreigners' (people who are not natives of Qamata) in the area?
    1 = Yes: ………… 2 = No: ………..

21. Which of the following age groups form greater part of the population?
    1 = older people (over 50 years old): …..
    2 = youth (between 20 and 49years old): …….
    3 = young people (between 0 and 19 years): …..

22. Which of the following statements about the crime rate in the area do you think is correct?
    1 = has increased in recent years because of the Scheme: ………
    2 = has decreased in recent years because of the Scheme: ………
    3 = has not change significantly to deserve attention: ………

23. Is there anything the officials and\or management of the Scheme have done which is against the customs and beliefs of the people of Qamata?
    1 = Yes: …….. 2 = No: ………..

24. Which of the following statements about the people's attitude towards culture, custom and tradition in the area do you think is correct?
    1 = shows respect: ………..
    2 = attitude undermines the culture, custom and tradition: ………..
    3 = do not know: ………..

25. What is the role of traditional leaders in the management and running of the Scheme?
    1 = take part in day-to-day management: ………..
    2 = rally the support and cooperation of the people for the Scheme: ………..
    3 = advise the management on issues of importance to traditional authority: ……

26. Describe the effect of the Scheme on traditional authority in the area:
    1 = has increased the authority and respect for traditional leaders: ………..
    2 = has eroded the authority and respect for traditional leaders: ………..
    3 = has not had much effect on the authority and respect for traditional leaders: …

27. Which government departments/institutions assist farmers at the Scheme?
    1 = Dept. of Agriculture/Land Affairs/Water Affairs: ……..
    2 = Chris Hani District Municipality/Dept. of Agriculture: …..
    3 = Chris Hani District Municipality/Eastern Cape Development Corporation: ….
    4 = Other: specify: …..
    5 = None: …….

28. Indicate the type of the assistance these departments/institutions offer the farmers:
    1 = Credit facilities: ….. 2 = Inputs (e.g. seeds, fertilizers, etc.): …..
    3 = Advice and extension service: … 4 = Marketing facilities: …..
    5 = Other. Specify: ……………….. 6 = None: ………

29. Is there any need for the development of other industries in Qamata area? (e. g. agro-based manufacturing industries)?
    1 = Yes: ………. 2 = No: ……………

30. Do you think the people in this area will be prepared to participate in such development? 1 = Yes: ……. 2 = No: ……..

31. Do you think the local resources (manpower, finance, institution, raw materials, etc.) can support such development? 1 = Yes: ……… 2 = No: ……

32. Do you find that more people are leaving the Scheme nowadays to find jobs elsewhere? 1 = Yes: ……… 2 = No: ……………..

THANK YOU!!!

APPENDIX 5

QUESTIONNAIRE FOR BUSINESSES IN QAMATA AREA

This survey is concerned with the transfer of irrigation technology and rural development in the Qamata area. It covers a wide range of social, political and economic issues.

The aim of this investigation is to solicit information that would enable:

1. the researcher to write a thesis for the degree of Doctor of Philosophy; and,
2. institutions engaged in rural development to direct their actions in a meaningful way.

Accurate information about Qamata area is important in this survey. It would therefore be appreciated if you could answer all the questions accurately.

Your name does not appear anywhere in the questionnaire. In addition, you do not have to sign the questionnaire or any other document. You remain entirely anonymous.

ENUMERATOR: …………………………………………… DATE: ………………
ADMINISTRATIVE AREA: ……………………………… VILLAGE: ……………

NB: Please mark with X next to the most appropriate answer in the spaces provided.

1. Kind of business
   1 = General dealer:…..
   2 = Butchery:….
   3 = Café:….
   4 = Bakery:….
2. Designation of respondent:
   1 = Owner:….
   2 = Owner's spouse:….
   3 = Manager:….
3. Age:
   1 = Under 20:….
   2 = 20-29:….
   3 = 30-39:….
   4 = 40-49:….
   5 = 50-59:….
   6 = 60 years and above: …..
4. Sex:
   1 = Male:….
   2 = Female:….
5. Were you in business at Qamata before the Scheme started?
   1 = Yes:….   2 =No:….
6. How has the Scheme affected your business?
   1 = increased turnover
   2 = decreased turnover
   3 = competition from other businesses
7. Do people buy different things than they did in the past?
   1 = Yes:……..   2 = No:……….
8. Has the composition of your stock changed over the years?
   1 = Yes:……..   2 = No:……….
9. How do you assess the standard of living of the people in the Qamata area since the Scheme was started?
   1 = Has improved:…….. 2 = Has declined:…… 3 = Has remained the same:……
10. Do you buy some of your stock from the local farmers?
    1 = Yes:……..   2 = No:……….
11. Describe the quality of the stock bought from the farmers:
    1 = Good:……..   2 = Fair:……..   3 = Poor:……..
12. Has the Scheme attracted many businesses to the Qamata area?
    1 = Yes: ……..   2 = No: …………

13. Are the youth no longer going to the cities to look for jobs because of the Scheme?
    1 = Yes: …….. 2 = No: …………

14. Has the scheme contributed towards the reduction of poverty in the area?
    1 = Yes: ………… 2 = No: ………..

15. Has the Scheme been able to reduce unemployment in the Qamata area?
    1 = Yes: ………… 2 = No: ………..

16. Which of the following statements about the crime rate in the area do you think is correct?
    1 = has increased in recent years because of the Scheme: ………
    2 = has decreased in recent years because of the Scheme: ………
    3 = has not change significantly to deserve attention: ………

17. Has the Scheme contributed towards the improvement of farming techniques of the irrigation farmers? 1 = Yes: ………… 2 = No: ………..

18. Have the dryland farmers outside the Scheme adopted some of the new farming techniques? 1 = Yes: ………… 2 = No: ………..

19. Can the Qamata Tribal Authority establish similar scheme elsewhere in the tribal area?
    1 = Yes: ………… 2 = No: ………..

20. Is there any need for the development of other activities in Qamata area? (e. g. Agro-based manufacturing industries)?
    1 = Yes: ………. 2 = No: ……………

21. Do you think the people in this area will be prepared to participate in such development?
    1 = Yes: ……. 2 = No: ……..

22. Do you think the local resources (manpower, finance, institution, raw materials, etc.) can support such development? 1 = Yes: ……… 2 = No: ……

23. Do you find that more people are leaving the Scheme nowadays to find jobs elsewhere?
    1 = Yes: ……… 2 = No: ……………..

24. Which of the following statements about the people's attitude towards culture, custom and tradition in the area do you think is correct?
    1 = shows respect: ………..
    2 = attitude undermines the culture, custom and tradition: ………..
    3 = I do not know: ………..

25. Do you think that the people who planned the Scheme understood of the problems, values and aspirations of the people of Qamata? 1 = Yes: …… 2 = No: ……

THANK YOU!!!

APPENDIX 6

INTERVIEW SCHEDULE

1. Age:

1 = Under 20 years: ….	2 = 20 – 29: ……………..
3 = 30 – 39: ………….	4 = 40 – 49: ……………..
5 = 50 – 59: ………….	6 = 60 and above: …….....

2. Who initiated the development of Qamata Irrigation Scheme (QIS)?

3. The development of QIS:
   - the role of the traditional leadership
   - the role of the state

4. Where were you when the construction of the Scheme began?

5. How long have you been living in the Qamata area?

6. Land allocation at QIS:
   - criteria
   - effects

7. Describe how the scheme is presently managed.

8. Describe the management role of the farmers under the present system of Management.

9. How was the scheme managed under Inter-Science/TRACOR?
10. What role did the farmers play in the management of the scheme?

11. What do you think has prevented the scheme from realising the intended objectives?

12. Consultation prior to the establishment of QIS:
    - who was consulted?
    - what was the consultation about?

13. Describe how the development policy was formulated and implemented.

14. Describe the role of the local community in the development of QIS.

15. When did your actual participation at QIS commence?

16. (a) Do you think the farmers have gained sufficient experience to manage the scheme on their own?

    (b) Give reason(s) for your answer

17. (a) Has the scheme achieved its objective of reducing poverty and food insecurity in the Qamata area?

    (b) Give reason(s) for your answer.

18. Comment on the ability and potential of QIS to initiate and sustain community development through innovation and transfer of technology to the local farming population.

19. Describe the impact of QIS on the development of agriculture at Qamata
20. How do the households survive (on farming alone)? (traders, hawkers).
21. Comment on the diversification of income portfolios at Qamata.
22. How do the households which do not have secure means of livelihood (especially those headed by females and unemployed people aged over 60 years) survive?
23. Factors that cause unemployment at Qamata.
24. What are the effects of electricity on informal activities?
25. Advantages of using electricity.
26. Common ailments at Qamata. Any incidence of cholera?
27. Toilet facilities.
    - households without toilet facilities.
28. How does your household keep refuse before disposing of them?
29. Where do you dispose of your household refuse?
30. Frequency of mobile clinic in your community.
31. Have you visited a traditional healer within the last three months?
32. Meals
    - the farmers in the 'Other' category, who are they?
33. Composition of household meals.
34. Prevalence of HIV/AIDS
    - role of health educators in your community
    - role of health inspectors in your community
35. Recreation activities and facilities and tourism.

THANK YOU!!!

APPENDIX 7

GUIDE: GROUP DISCUSSION WITH EXTENSION OFFICERS

1. Credit and productivity of subsistence farming.
2. Housing
   - ownership
   - overcrowding
3. Disposal of household refuse.
4. Mobile clinics and their role in healthcare.
5. Food and nutrition
   - who are the farmers in the following categories?
   - meal each other day.
   - weekly access to full meal
   - fortnightly or monthly access to full meal
   - ‘Other’
   - composition of household meals besides full meal
6. Spread and prevention of HIV/AIDS at Qamata
7. Recreation activities and facilities.
8. Land preparation
   - problems
   - solutions
9. Use of fertilizers and manure
   - effects on output
   - maize
   - cabbage
   - vegetables
10. Pests and methods of pest control
    - Subsistence farms
    - Commercial farms
11. Control of weeds
12. Soil erosion
    - causes
    - effects
    - solution
13. Droughts and effects on farming
14. Qualifications and experience of extension officers
    - facilities
    - challenges
    - records keeping
15. Training of farmers
    - nature of training

- entrepreneurial skills
- technical skills (repair of equipment e.g. tractors)
- farmers’ involvement and demand
- facilities

16. Participation at QIS
    - decision-making
    - management of QIS

17. Economic importance of QIS

18. Cost recovery measures at QIS
    - inputs
    - services
    - water

19. Sources of information about the latest innovations in farming and irrigation development.

20. Employment opportunities at Qamata.

THANK YOU!!!

APPENDIX 8

GUIDE: GROUP DISCUSSION WITH IRRIGATION FARMERS

1. Age and effects on productivity
    - physical vitality
    - mental vitality
2. Marketing/disposal of produce
    - cash sale
    - payment in kind
    - effects of glut
3. Role of cooperative societies in agricultural and rural development
4. Participation in cooperatives societies
5. Diversification of income portfolios
    - remittances
    - social grants
6. Livestock keeping and importance
7. Informal sector
    - contribution
    - challenges
8. Housing
    - social effects of overcrowding
9. Common ailments at Qamata. Any incidence of cholera?
10. Toilet facilities.
    - households without toilet facilities.
11. How does your household keep refuse before disposing of them?
12. Where do you dispose of your household refuse?
13. Frequency of mobile clinic in your community.
14. Have you visited a traditional healer within the last three months?
15. Full meal: The farmers in the 'Other' category, who are they?
16. Composition of household meals.
17. Prevalence of HIV/AIDS.
18. Migration and farm labour
    - female participation in farming
    - direction of movement
19. Recreation activities and facilities and tourism.
20. Land preparation
    - most important equipment/implements
    - problems
    - effects
    - solutions

21. Use of fertilizers and manure
    - effects
    - sources of supply
22. Pest and methods of pest control
    - on food crop farms
    - on commercial farms
23. Farm practices
    (a) Extension service visitation
    - Perception of farmers about extension officers

    (b) Water scheduling
    - perception of farmers about water scheduling

    (c) Weed control measures
24. Records of farm transactions and bookkeeping
25. Access to credit and credit facilities
    - sources
    - utilisation
26. Participation
    - decision-making
    - management
27. Economic importance of QIS
28. The effects of cost recovery measures at QIS
    - inputs
    - services
    - water
29. The role and contribution of TRACOR in skills development irrigation technology transfer.

THANK YOU!!!

APPENDIX 9

GUIDE: GROUP DISCUSSION WITH DRYLAND FARMERS

1. Age and effects on productivity
    - physical vitality
    - mental vitality
2. Marketing/disposal of produce
    - cash sale
    - payment in kind
3. Role of cooperative societies in agricultural and rural development.
4. Participation in cooperatives societies
5. Diversification of income portfolios
    - remittances
    - social grants
    - homestead garden
    - livestock
    - full time farming
6. Livestock keeping and importance
7. Informal sector
    - contribution
    - challenges
8. Housing
    - ownership
    - overcrowding
9. Common ailments at Qamata. Any incidence of cholera?
10. Toilet facilities.
    - households without toilet facilities.
11. How does your household keep refuse before disposing of them?
12. Where do you dispose of your household refuse?
13. Have you visited a traditional healer within the last three months?
14. Full meal: The farmers in the ‘Other’ category, who are they?
15. Composition of household meals.
16. Prevalence of HIV/AIDS.
17. Migration and farm labour
    - female participation in farming
    - direction of movement
18. Recreation activities and facilities and tourism.
19. Land preparation
    - most important equipment/implements
    - problems

- effects
- solutions

20. Use of fertilizers and manure
    - effects
    - sources of supply
21. Pest and methods of pest control
    - on food crop farms
    - on commercial farms
22. Methods of farm production compared with irrigation farming
    - similarities
    - differences
23. Droughts and effects on farming
24. Access to credit and credit facilities
    - sources
    - utilisation

THANK YOU!!!