

**AGRICULTURAL EXTENSION AND
NATURAL RESOURCE MANAGEMENT IN MOZAMBIQUE
WITH PARTICULAR REFERENCE TO CABO DELGADO PROVINCE**

by

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DEDICATION

To my late wife who inspired me

ABSTRACT

The Agricultural Extension, within the context of Mozambique, is an important force towards agricultural and rural development. Practically, the agricultural policy and programme of the government is implemented through these services. Mozambique has accepted agriculture as the foundation for the development of the country given that this activity sustains the livelihoods of almost the entire population. Moreover, Mozambique is a potential natural resource country, in where, its potential ranges from terrestrial to marine resources. For the purpose of this study, natural resource management refers mainly to the adequate management of the land, water, forests and wildlife by local communities.

These facts imply that if the policy goals of the government are the agricultural and the rural development, than the Agricultural Extension role must be redefined to include promoting natural resource management. A most effective way of redefining this role is through supporting the relationship between agricultural extension and natural resource management. This relationship would provide stakeholders involved in the agricultural development scenario in Mozambique with a clear picture of the environment surrounding the Agricultural Extension service for future sound decisions.

The relationship between Agricultural Extension and natural resource management was investigated through a survey conducted with extension workers and farmers in Cabo Delgado province in north of Mozambique. Key informants at district, provincial and national level assisted the study. The survey results are presented as three articles submitted for publication in the South African Journal of Agricultural Extension.

It became evident that the relationship between agricultural extension and natural resource management is a prerequisite for agricultural and rural development in Mozambique. Further, several limiting factors adjoined to the policy framework in agricultural development, Agricultural Extension approaches and farmers behaviour were identified as hampering that relationship, and therefore, need to be shifted or improved.

PREFACE

The work described in this dissertation was carried at the Centre Environment, Agriculture and Development, school of Environmental Sciences, University of KwaZulu-Natal, Pietermaritzburg and in Cabo Delgado province, Mozambique, from December 2004 to December 2005. Mr. Steve Worth, Senior Lecturer at the Centre for Environment, Agriculture in the School of Environmental Sciences supervised the research.

The research reported in this dissertation represents original work by the author except where acknowledged and has not otherwise been submitted in any form for any degree to any other University.

Signed 

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TABLE OF CONTENTS

| | |
|---|-------------|
| DEDICATION..... | I |
| ABSTRACT..... | II |
| PREFACE..... | III |
| TABLE OF CONTENTS | IV |
| ACKNOWLEDGEMENTS | VI |
| LIST OF ABBREVIATIONS | VIII |
| LIST OF TABLES..... | IX |
| CHAPTER ONE..... | 1 |
| GENERAL INTRODUCTION | 1 |
| 1.1 Introduction | 1 |
| 1.2 Brief profile of Mozambique | 1 |
| 1.3 Structure of the paper | 3 |
| REFERENCES..... | 5 |
| ANNEXE 1..... | 6 |
| CHAPTER TWO..... | 7 |
| AGRICULTURAL EXTENSION IN MOZAMBIQUE WITH SPECIFIC REFERENCE TO CABO DELGADO PROVINCE..... | 7 |
| ABSTRACT..... | 7 |
| 2.1 Introduction | 7 |
| 2.2 Provision of Agricultural Extension in Mozambique..... | 8 |
| 2.2.1 Timeline (historical overview) of Rural Extension in Mozambique | 9 |
| 2.2.1.1 Initial development of Rural Extension in Mozambique (1987-1992).9 | |
| 2.2.1.2 Expansion of Rural Extension by World Bank support of PROAGRI (1992-2001) | 10 |
| 2.2.1.3 Mozambique’s move towards a pluralistic national system of RE (2001 onwards) | 11 |
| 2.2.2 The policy environment affecting Rural Extension in Mozambique..... | 12 |

| | |
|---|-----------|
| 2.2.3 Structure of public sector Rural Extension in Mozambique..... | 14 |
| 2.2.4 Non-governmental organizations and private sector Rural Extension in Mozambique 16 | |
| 2.3 Approaches to Rural Extension in Mozambique..... | 17 |
| 2.3.1 Approaches to public sector Extension..... | 17 |
| 2.3.2 Approaches to non-governmental organisations and private sector | 17 |
| 2.4 Agricultural Extension in Cabo Delgado province..... | 18 |
| 2.4.1 The basic geography of the Cabo Delgado province..... | 18 |
| 2.4.2 Public sector Rural Extension..... | 20 |
| 2.4.3 NGO and private sector agricultural extension | 22 |
| 2.4.4 The relationship between public sector and other Rural Extension providers .. | 22 |
| 2.5 Conclusions and recommendations..... | 23 |
| REFERENCES | 25 |
| ANNEXE 2 | 27 |
| ANNEXE 3 | 28 |
| CHAPTER THREE..... | 30 |
| THE RELATIONSHIP BETWEEN AGRICULTURAL EXTENSION AND NATURAL RESOURCE MANAGEMENT IN CABO DELGADO PROVINCE NORTHERN MOZAMBIQUE | 30 |
| ABSTRACT..... | 30 |
| 3.1 Introduction..... | 30 |
| 3.1.1 Agricultural development and Extension | 31 |
| 3.1.2 Natural resource management - concept and approaches..... | 32 |
| 3.2 Problem statement | 32 |
| 3.3 Brief description of the study area | 34 |
| 3.4 Methodology of the study | 35 |
| 3.5 Results and discussion | 36 |
| 3.5.1 Farming characteristics..... | 36 |
| 3.5.2 Land tenure | 37 |
| 3.5.3 Farmers organizations..... | 38 |
| 3.5.4 Farming practices and their relation to Rural Extension | 38 |
| Table 3.2: Farming practices and adoption farmer respondents (n=100)..... | 39 |
| 3.5.5 Training in natural resource management issues..... | 40 |
| 3.6 Conclusions and recommendations..... | 41 |

| | |
|---|-----------|
| REFERENCES | 42 |
| ANNEXE 4 | 44 |
| CHAPTER FOUR | 52 |
| CONSTRAINTS AFFECTING THE ABILITY OF AGRICULTURAL EXTENSION TO IMPROVE NATURAL RESOURCE MANAGEMENT IN FOUR DISTRICTS OF CABO DELGADO PROVINCE IN NORTHERN MOZAMBIQUE | 52 |
| ABSTRACT..... | 52 |
| 4.1 Introduction..... | 52 |
| 4.2 Geographic facts from Cabo Delgado province..... | 53 |
| 4.3 The extension system in Mozambique and its approach to natural resource management | 53 |
| 4.4 Meanings and concepts..... | 54 |
| 4.4.1 The meaning of Extension | 54 |
| 4.4.2 Sustainable agricultural development – the paradox | 55 |
| 4.5 The research procedure | 56 |
| 4.6 Findings and discussion..... | 57 |
| 4.6.1 Demographics of respondents..... | 57 |
| 4.6.2 Constraints to the Rural Extension ability to improve natural resource management 58 | |
| 4.6.2.1 Limited availability of logistics | 58 |
| 4.6.2.2 Lack of coordination among extension providers | 59 |
| 4.6.2.3 Weak research-extension linkage | 59 |
| 4.6.2.4 Lack of incentives and motivation..... | 60 |
| 4.6.2.5 Little or Inappropriate in-service training..... | 60 |
| 4.6.2.6 Limited focus in natural resource management issues | 61 |
| 4.7 Conclusions and recommendations..... | 61 |
| REFERENCES | 63 |
| ANNEXE 5 | 65 |
| CHAPTER FIVE | 72 |
| GENERAL CONCLUSIONS AND RECOMENDATIONS | 72 |
| 5.1 General conclusions | 73 |
| 5.2 General recommendations | 74 |

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LIST OF ABBREVIATIONS

| | |
|--------------------|---|
| AAA | German Agro Action |
| CBNRM | Community-Based Natural Resource Management |
| DDADR | District Directorate of Agriculture and Rural Development |
| DNER | National Directorate for Rural Extension |
| FAO | Food and Agriculture Organisation of the United Nations |
| FRELIMO | Mozambique's political Party |
| GDP | Gross Domestic Product |
| GECORENA | Community Management of Natural Resources |
| GOM | Government of Mozambique |
| GTZ | German Society for Technical Cooperation |
| IBIS | Danish Association for International Cooperation |
| IFAD | International Fund for Agricultural Development |
| INE | National Statistics Institute |
| INRM | Integrated Natural Resource Management |
| LEISA | Low External Input for Sustainable Agriculture |
| MADER | Ministry of Agriculture and Rural Development |
| MAP | Ministry of Agriculture and Fisheries |
| MINAG | Ministry of Agriculture |
| NGO | Non-governmental Organisation |
| NRM | Natural Resource Management |
| PROAGRI | National Programme for Agricultural Development |
| RE | Rural Extension |
| RENAMO | Mozambique's political Party |
| REPETE | Periodic Technology Review |
| SISNE | Integrated System of Rural Extension |
| SPER | Provincial Services of Rural Extension |
| SUE | Unified Extension System |
| T&V | Training and Visit Approach |
| UN | United Nations |
| UNDP | United Nations Development Programme |
| UNICEF-IRDP | United Nations Children's Education Fund – Integrated Rural Development Programme |
| WWF | World Wildlife Fund |

LIST OF TABLES

| | |
|--|----|
| Table 2.1: Significant policies affecting the agricultural development in Mozambique... | 14 |
| Table 3.1: Number of farmer respondents per district..... | 37 |
| Table 3.2: Farming practices and level of adoption by farmer respondents..... | 39 |
| Table 3.3: Training in NRM and level of attendance by farmer respondents..... | 41 |
| Table 4.1: An overview of the number of respondents in each survey district..... | 59 |
| Table 4.2: Constraints affecting RE ability to improve NRM..... | 60 |

CHAPTER ONE

GENERAL INTRODUCTION

1.1 Introduction

The thesis presents the results of a study investigating the relationship between agricultural extension services (in Mozambique referred to as Rural Extension, RE) and natural resource management (NRM) in Mozambique with particular reference to Cabo Delgado province.

Uphoff (1998) defines NRM as the management of potential and comprehensive impacts of people on the environment with the purpose of attaining ecological sustainability and maintaining the biodiversity. For the purpose of this study, NRM refers primarily to the management of land, water, forests and wildlife in order to attain the objectives stated in Uphoff. The general objectives of NRM are associated with two important policy goals: conservation of the natural resource base and agricultural or rural development (Uphoff, 1998).

The study was carried out under the belief that a strong RE/NRM relationship will create the foundations for agricultural and rural development in Mozambique. The study aims at providing an insight about RE services from the time of its establishment in Mozambique to its current situation. It also gives suggestions and recommendations to address the relationship between RE and NRM.

1.2 Brief profile of Mozambique

Located in the South-eastern coast of Africa (see Annexure 1), Mozambique is ranked one of the poorest countries in the world (Ribeiro, 2001). According to a census, the country had just 16.1 million inhabitants in 1997 (INE, 1999). With a total area of 799,380 km², which averages 21 people per km², Mozambique's population density is not currently a significant factor in agricultural development in Mozambique. The area of potentially arable land is estimated to be 36.1 million hectares, although the cultivated area ranges from 20 to 30 percent, including plantations. Agriculture plays a key role in the

development of the country's economy accounting for about 25 percent of the Gross Domestic Product (GDP) and involving around 75 percent of the active population (INE, 2000). Based on the actual income per capita, practically the entire population in Mozambique can be characterized as poor (Christie, 1996; Ribeiro, 2001). Prior to the end of the civil war in 1992, famine was a common problem. Food shortages were caused by a blend of factors including pests, human/wildlife competition, weather hazards, inadequate agricultural input supply and poor yields. However, since the end of the civil war, famine has almost been eliminated. Although the end of the war prompted Mozambique to become one of the fastest growing economies in the world, rural people have been the slowest to benefit from this economic growth and the country remains dependent on foreign donors (Ribeiro, 2001).

Mozambique is administratively divided into 11 provinces (INE, 2000). However, only 10 provinces are considered for agricultural purposes, as the eleventh province is the capital city Maputo. The northern provinces, situated two to three thousand kilometres from Maputo, are the most impoverished even though they have been recognized as having enormous natural resource potential for agricultural and forestry production. The natural resources of Cabo Delgado, the northern province where the current study was conducted, include terrestrial and marine components (WWF, 2002). Agriculture and fishing activities are the foundation of livelihoods of almost the entire population of the Cabo Delgado province, providing both food and income (Christie, 1996). While this is the case, in this study, natural resources refer mainly to the terrestrial component i.e. the land, water, forests and wildlife.

Typical to Mozambique, agriculture in Cabo Delgado is rain fed and characterized by smallholdings using basic agricultural techniques with very low yields (Ribeiro, 2001). The main reasons for low yields among the peasant family production, which occupies almost 90% of the cultivated area in the province, are identified as soil degradation, pests and inadequate agricultural input supply. The main crops produced in the province are maize, cassava, beans, sorghum, groundnuts, rice, sesame, cotton, cashew nuts, tubers and vegetables (Livro Branco dos Recursos Naturais da Provincia de Cabo Delgado, 2001). Agricultural services, represented either by the public sector, NGOs or private firms, operate in the Cabo Delgado province. Practically, the agricultural programme of the Ministério da Agricultura e Desenvolvimento Rural [Ministry of Agriculture and Rural

Development] MADER, (now Ministry of Agriculture, MINAG)¹ is executed through RE pertaining to those agricultural services in the province. RE services, which are represented in the 10 provinces of Mozambique, have a relative large staff and spend the major share of the MINAG's budget (MAP, 1997).

1.3 Structure of the paper

This paper results from a study conducted in Cabo Delgado province in north of Mozambique. A survey was conducted among extension workers and farmers to obtain their views and perceptions about issues related to the relationship between RE and NRM. Additional information to substantiate the research findings was obtained through key informants and a review of literature. The information is compiled and presented in five chapters.

Chapters One and Five frame Chapters Two, Three and Four. Chapter Two, Three and Four are presented as articles submitted for publication to the South African Journal of Agricultural Extension, co-authored by the research supervisor. Each chapter has its own set of references.

Chapter Two is based on secondary information made available through a literature review and key informants in Mozambique. It examines RE services in Mozambique, giving particular reference to Cabo Delgado province. The first part of Chapter Two is a chronological description of RE services and the policy environment affecting the agricultural sector in Mozambique. Then it comparatively describes and discusses the RE structure and approaches adopted by existing RE providers in Mozambique. Following the same format, the chapter explores agriculture and RE in Cabo Delgado province. The chapter concludes with an examination of the relationships among the various RE providers in the province.

Chapter Three outlines the methodology for the two components of the field research conducted. It presents the results of the first component, a survey carried out with farmers

¹ During the course of the research the name of the ministry was changed to Ministério da Agricultura. Previously the ministry was known as Ministério da Agricultura e Pescas (MAP). When used in this study the acronyms MADER, MAP and MINAG effectively refer to the same institution, i.e. the ministry responsible for RE.

in Cabo Delgado province. The chapter examines issues pertaining to the relationship between RE and NRM in Mozambique, again with particular reference to Cabo Delgado province. Particularly in Cabo Delgado the chapter looks at the following issues: farming characteristics; land tenure; farmers' organizations; farming practices and its relationship to RE; and training in NRM issues.

Chapter Four presents the results of the second field research component, which was a survey, conducted with extension workers in Cabo Delgado province. The chapter analyses and discusses factors affecting the relationship between RE and NRM in Cabo Delgado province according to extension workers' views and perceptions.

Finally, Chapter Five summarizes the study paper. It synthesises the conclusions and recommendations drawn in Chapters Two, Three and Four.

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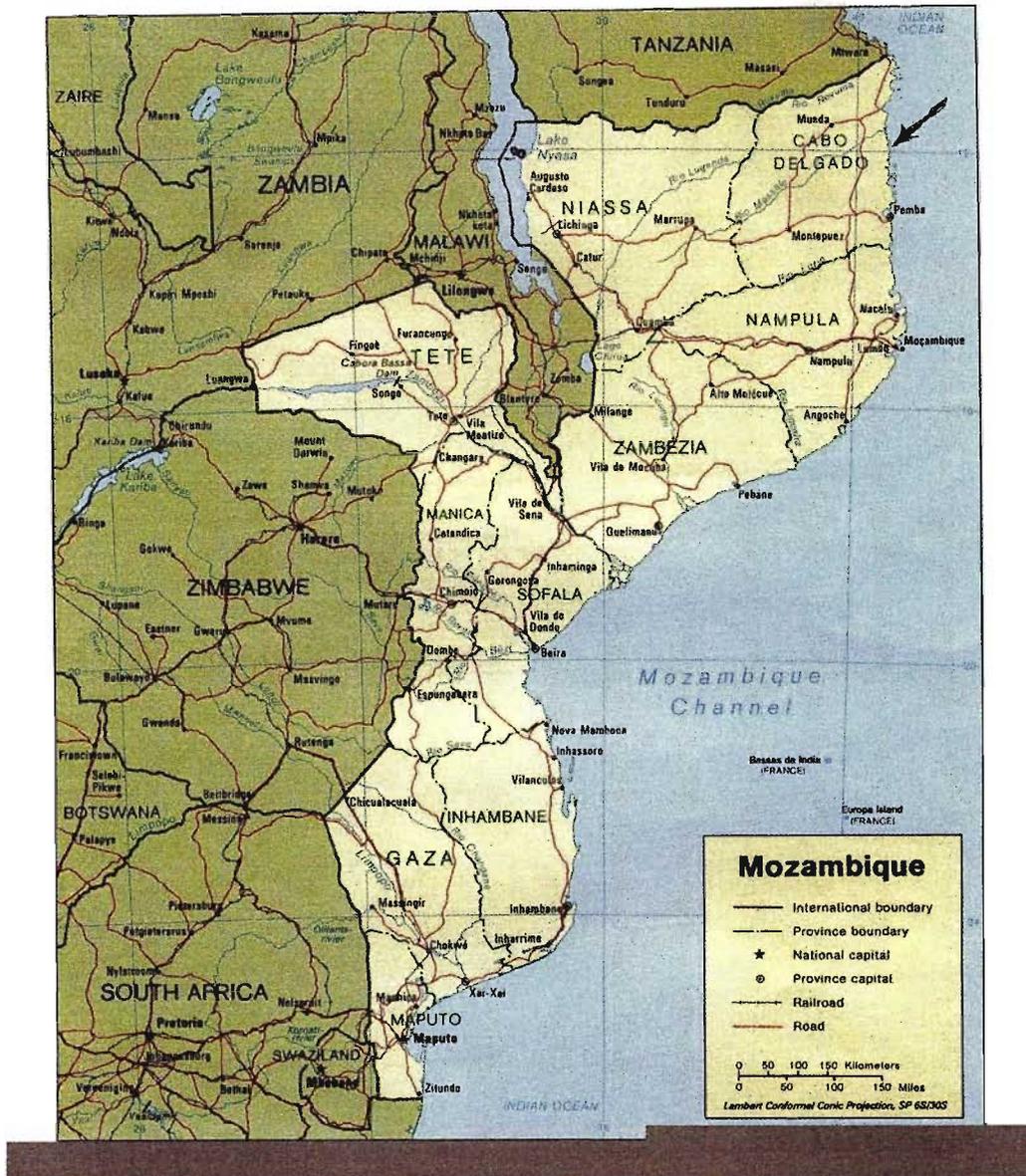
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Annexe 1

Mozambique Map



Source: http://www.lib.utexas.edu/maps/africa/mozambique_pol95.jpg

The arrow in the upper left hand side of the map shows the province of Cabo Delgado, where the present study was conducted

CHAPTER TWO

AGRICULTURAL EXTENSION IN MOZAMBIQUE WITH SPECIFIC REFERENCE TO CABO DELGADO PROVINCE

(Submitted for publication in the South African Journal of Agricultural Extension)

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Abstract

Agricultural Extension in Mozambique and, in particular Cabo Delgado province, has evolved and adapted as the socio-political changes have taken place. After more than 20 years of agricultural extension service delivery, there are still several issues that need improvements. The Agricultural Extension system is inflexible and 'top-down'; public sector human and financial resources are inadequate; and Agricultural Extension providers do not coordinate programmes and resources. To be effective, Mozambique's Agricultural Extension services require locally tailored participatory approaches, which are more responsive to farmers' problems. Agricultural Extension must shift to facilitated/learning-based extension. Resources and programmes need to be coordinated and managed through well-planned and well-structured partnerships among agricultural extension providers and other stakeholders in the agricultural development. Most importantly, adoption of technologies should be fostered through the dissemination of adequate and problem-solving technologies that mobilize farmers' interest. In parallel, innovation based on the synergy between farmers' local knowledge and modern approaches to agricultural development, such as low external input technologies affordable to farmers, must be enhanced by introducing elements of farmer participation and group approaches into agricultural extension. Finally, the design of a unique national agenda for Agricultural Extension providers, which involves the participation of all stakeholders in agricultural development, appears to be the necessary long-term solution.

2.1 Introduction

Agricultural Extension (in Mozambique referred to as Rural Extension, RE) has been used by governments as an instrument to achieve its development policy objectives (van den Ban and Hawkins, 1996). Since 1987 the Government of Mozambique (GOM) has introduced legislation, policies and programmes aimed at providing and improving agricultural extension to promote agricultural and rural development to the farming community (Nhantumbo *et al*, 2003).

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This paper will analyse the provision of RE in Mozambique with particular reference to Cabo Delgado province, to identify the key factors constraining successful agricultural and rural development. To support the analysis, the paper provides an historical overview of RE in Mozambique, outlines the policy environment affecting agricultural development, and examines the relationship between public sector RE and other extension providers, mainly non-governmental organisations (NGOs). It provides an analytical description of RE in Cabo Delgado province, north of Mozambique, which is the primary focus of this paper. It briefly comparatively describes the structure for and approaches to RE provided by the government, private agencies and NGOs in Cabo Delgado province. Finally, it provides recommendations for improving RE in Cabo Delgado province and thereby agricultural and rural development.

For the purpose of this study NRM refers to the management of potential and comprehensive impacts of people on the environment with the purpose of attaining ecological sustainability and maintaining the biodiversity (Uphoff, 1998). Specifically it refers mainly to the management of land, water, forests and wildlife. The general objectives of NRM are associated to two important policy goals: conservation of the natural resource base and agricultural or rural development (Uphoff, 1998).

The paper results from a survey conducted in Cabo Delgado that investigated the relationship between agricultural extension and natural resource management (NRM). It synthesizes information accessed through a survey conducted amongst key informants and a review of literature.

2.2 Provision of Agricultural Extension in Mozambique

Credited as one of the most recent in sub-Saharan Africa, the institutionalisation of public sector RE in Mozambique took place in 1987, although its consolidation happened between 1989 and 1992 (Gêmo & Rivera, 2001). The end of the civil war guaranteed by the General Peace Agreement in 1992 between the two main political parties, FRELIMO and RENAMO, saw the return of security in rural areas. This allowed room for investments in Mozambique with the World Bank initiating financial assistance to public sector extension in Mozambique. This was expanded in 1998, resulting in the National Programme for Agricultural Development (PROAGRI), which was a joint financial initiative between the World Bank and the GOM. Revitalising RE in Mozambique was one

of the eight components of PROAGRI. This resulted in enhancing the financial capacity of the MINAG, then Ministério da Agricultura e Desenvolvimento Rural [Ministry of Agriculture and Rural Development] MADER, (now Ministério da Agricultura, MINAG) to deliver RE services (Gêmo & Rivera, 2001).

Presently, RE is organised in four levels: national, provincial, district (called networks) and village (called teams). It is managed through a single chain of command from national to village level and operates under a single (national) policy and funding framework. The RE system recently changed to include private and NGO extension providers as a means of expanding delivery capacity of extension. It has also adopted a more flexible approach to funding as a means of expanding the financial resources available to Extension (MAP, 1997).

2.2.1 Timeline (historical overview) of Rural Extension in Mozambique

Gêmo & Rivera (2001) describe the development of rural extension in Mozambique as occurring in three main phases:

- Initial development of RE in Mozambique (1987-1992),
- Expansion of RE by World Bank support of PROAGRI (1992-2001), and
- Mozambique's move towards a pluralistic national system of RE (2001 onwards).

2.2.1.1 Initial development of Rural Extension in Mozambique (1987-1992)

In 1987 RE was formally institutionalised in Mozambique (Gêmo & Rivera, 2001). Using institutional and technical support from international NGOs, the GOM positioned defunct State farms to provide the initial foundation for public sector extension. The first technical and financial support for extension was granted by United Nations (UN) agencies such as the Food and Agriculture Organisation, the Children's Education Fund - Integrated Rural Development Program, Development Programme and the International Fund for Agricultural Development. Prolonged natural calamities including droughts and floods significantly influenced the initial development of RE. In addition, the civil war (1976-1992) made the rural areas very insecure and consequently inhibited the progress and development of normal extension activities (Gêmo & Rivera, 2001).

Due to the war and natural disasters during this phase, people left the rural areas for safer places including neighbouring countries. This left no one to care for the land and agricultural production virtually stopped. However, natural resources benefited in that forests and tree-based landscapes were generally allowed free growth because of limited exploitation of forest and non-forest products (Gêmo & Rivera, 2001).

2.2.1.2 Expansion of Rural Extension by World Bank support of PROAGRI (1992-2001)

With the end of the war in 1992, the scenario quickly changed and Mozambique had to embark on a series of negotiations with international funding agencies such, as the World Bank, to improve the agricultural sector. In terms of RE there was no significant movement or development. In 1998 the World Bank financed PROAGRI – one of the GOM strategies to improve the agricultural sector after the disruption following sixteen years of civil war (Gêmo & Rivera, 2001). The objectives of PROAGRI were: (1) to transform the MINAG into a modern institution for public sector interventions in support of the agricultural sector; (2) to increase agricultural production and productivity in order to improve income and food security for rural households; and (3) to protect, conserve, develop and ensure public access to natural resources in a sustainable basis (MAP, 1997). The PROAGRI objectives were to be addressed through eight thematic components: institutional development; research; extension; support for crop production; support for livestock production; support for forestry and wildlife management; land management; and irrigation. PROAGRI also outlined GOM's responsibility for the establishment of a legal environment favourable to agricultural development (Gêmo & Rivera, 2001). Some of the responses by the GOM to PROAGRI affecting RE included the following:

- National Agricultural Extension Master Plan (1997)
- SISNE (Sistema Nacional Integrado de Extensão Rural) which is the Integrated National System of Rural Extension (1998-2003)
- SUE (Sistema Unificado de Extensão) which is the Unified Extension System (1998)

Inspired by the new financial capacity provided by PROAGRI, the Direcção Nacional de Extensão Rural [National Directorate for Rural Extension] (DNER) started operating 48

extension networks throughout the country, in 68 of Mozambique's 128 districts (the number increased to 51 extension networks in 2001). DNER also took over the management of private sector providers in those areas not covered by the public sector extension (Gêmo & Rivera, 2001). (See Section 2.4 for an explanation of extension networks).

In this phase Cabo Delgado started operating the Serviços Provinciais de Extensão Rural [Provincial Services of Rural Extension] (SPER) and three extension networks in an equal number of districts, namely Mueda, Chiúre and Montepuez covering the North, Centre and South of the province (Julião, 2004). This coverage was projected to familiarize communities in each region with the new practices disseminated by the RE services. Another objective was to facilitate the regional expansion and establishment of other extension networks through collaboration of the existing ones with neighbour districts (Julião, 2004).

2.2.1.3 Mozambique's move towards a pluralistic national system of RE (2001 onwards)

Mozambique is moving towards a pluralistic national system of RE (Gêmo & Rivera, 2001). This constitutes a new phase for RE in Mozambique which opens the way to multiple delivery and financial arrangements to expand the capacity of RE. The adoption of an outsourcing strategy will enable the GOM to involve private sector and NGO extension service providers, thereby increasing delivery capacity. Cost sharing with private and community extension structures, and cost-recovery initiatives with individual farmers and farmer's groups or associations will also expand the financial resource base for RE (Gêmo & Rivera, 2001).

This stage is the first step in the preparation and implementation of SISNE where public sector, private sector, NGOs, farmer associations and other recognized extension providers ought to coexist. This stage is intended to provide a foundation for DNER to learn to coordinate, oversee and regulate its own activities and the activities of other extension service providers in a comprehensive and coherent manner (Gêmo & Rivera, 2001).

2.2.2 The policy environment affecting Rural Extension in Mozambique

Following the civil war, through which the delivery of public sector services was completely devastated, the GOM started the reformulation of its policy framework (Nhantumbo *et al*, 2003). The objectives of this reformulation were to respond to the socio-political and economic changes resulting from the end of the war. Agricultural development policies were adjusted in order to attract investments internationally and to positively affect rural communities internally (see Table 2.1). Since the GOM had stated Agriculture as the foundation for the development of the country, added attention was placed on this area. As a result, the reformulation of agricultural development policies was among the most debated issues among the Mozambican politicians, academics and government officials, culminating in well-envisioned guiding principles (Nhantumbo *et al*, 2003).

The significance of these reformulated policies is that they ensured access to natural resources by the rural people who constitute almost 80% of the entire population. These policies not only aim at devolving control over natural resources to users but also at stimulating their participation in the management and decision making processes (Nhantumbo *et al*, 2003). In this new legal environment, the protection, conservation and sustainable use of NRM became a priority and were further reinforced by the objectives of PROAGRI (MAP, 1997). In addition, the policies formulated for RE were also derived from PROAGRI. These policies (see Table 2.1), among other objectives, intended to improve the knowledge base of producers in terms of improved use of available resources (e.g. land, water, forest, animal and labour force) and to consolidate and develop the capacity to implement the extension program (MAP, 1997). The Table 2.1 shows some of the most significant policies and regulations affecting renewable natural resources adopted by the GOM as a condition to expand the rural economy and to improve the living conditions of rural families, thereby to promote the country's economic growth. Table 2.1 shows some of the most important policies and regulations affecting renewable natural resources adopted recently by the GOM as a condition to expand the rural economy and to improve the living conditions of rural families, thereby to promote the country's economic growth. Among the strategies approved by the GOM that affect the use of natural resources, the most important of which are listed in Table 2.1:

Table 2.1: Significant policies affecting the agricultural development in Mozambique

| Sector | Policy | Objectives |
|-----------------------|---|--|
| Land | Land Policy (1995) Land law (19/1997) Land law regulations (66/1998) Technical appendix to the land law (1999) | Establish clear property rights over land and devolve control over the land to users |
| Environment | Environment law (20/1997) Regulation for Environmental Impact Assessment (76/1998) | Mitigate environmental damages by promoting the sustainable management of the environment |
| Forestry and Wildlife | Forestry and Wildlife National Program (1998) Policy and Strategy for Development of Forestry and Wildlife (8/1999) Forestry and Wildlife law (10/1999) Forestry and Wildlife regulations (2002) | Sustainable use of forests and wildlife products including its protection, conservation and development |
| Agriculture | Agrarian Policy (1995) National Agricultural Development Program, including a component in support of government initiatives towards the implementation of Community Based Natural Resources Management (CBNRM). | Promote sustainable use of natural resources for the development of agriculture and sustainable development of the country |
| Rural Extension | National Agricultural Extension Master Plan (1997) Unified Extension System SUE (1998) National Integrated Extension System SISNE (1998 – 2003) | Improve service delivery, foster partnerships among agricultural extension providers and assist farmers according to their needs |
| Water | Water Policy (1995) | Promote access to water by the most needy population |

Source: Adapted from Nhantumbo *et al* (2003)

Nhantumbo *et al* (2003) noted that these policies were designed to ensure that communities living in and around the natural resources were the first to benefit from those resources. However, Nhantumbo *et al* (2003) also noted that the policies shown in Table 2.1 prove the government's recognition of its incapacity to be the legislator, law enforcer and the provider of all services. These policies also introduced concepts such as 'decentralisation' and 'community-based resource management', which have been growing in popularity (Virtanen, undated). The new legal framework also refers to principles of community and private sector participation and recognizes the local knowledge and some basic rights of local communities. All of these policies have in common a single theme: that consideration should be given to local knowledge about the management of natural resources (Nhantumbo *et al*, 2003).

Ribeiro (2001) argues that Mozambique started to pay more attention to community-based resource management initiatives since 1992 following the UN Conference on Environment and Development held in Rio de Janeiro. At the same time, the government started to offer

more incentives and formulate policies to stimulate benefit to communities in rural areas. For instance, provisions in the new Law of Forestry and Wildlife state that before timber cutting, each timber company must get the community approval through consultation. Leaders of those communities must be skilled enough to negotiate for the construction of basic infrastructures, such as wells, schools, hospitals and roads that will benefit all of the community. In addition, the new policy environment empowers RE to play a role in supporting communities to broaden their vision for better decision-making and improve their negotiation abilities. The general idea is that of creating a policy environment conducive to the improvement of NRM practices through an increased community sense of ownership and responsibility (Ribeiro, 2001).

Within the framework of PROAGRI, the government formulated the National Agricultural Extension Master Plan (Gêmo & Rivera, 2001). This extension policy envisages the establishment of a national extension system that encompasses all of the Ministry's extension activities and encourages the collaboration of other non-governmental and private sector agricultural service providers (MAP, 1997). The strategy of the National Agricultural Extension Master Plan consists of maximizing the contribution of the stakeholders in agricultural development, namely the State, Private Sector and NGOs, in responding, to the extent possible, to the needs of a large number of producers (MAP, 1997).

2.2.3 Structure of public sector Rural Extension in Mozambique

Public RE services are provided by the MADER in each of the 10 provinces through the DNER. Each province has a chief of SPER, who reports in a direct line to the National Directorate (Amimo, 2004). In each province, RE is provided through a system of extension networks established using the boundaries of administrative districts. The main criterion for the establishment of extension networks in districts is the agricultural potential as declared by the DNER. However, other factors such as the population density, agro-ecological characteristics, infrastructure, and the degree of rural poverty are also considered (Gêmo, 2001).

Typically an extension network is comprised of 8 to 24 extension workers, one of whom will be the supervisor of the network. The supervisor is chosen based on his/her higher

qualifications, professional experience and personnel conduct (behaviour). The network supervisor is a practicing extension worker, but he/she will also have administrative and managerial responsibilities such as coordinating the RE services of the network and facilitating reports. The network supervisor reports to the head of the RE services in the district (Gêmo, 2001).

A network is usually a further divided geographically into teams of 8 extension workers. Thus, in general, there will be one, two or three teams in a district network. Again, each team will have a supervisor who will also be a practicing extension worker. The main function of the team supervisor is to promote collaboration and communication among the team members as well as to provide basic administrative support. It is not generally a decision-making position. The team supervisor reports to the network supervisor. To ensure a wide distribution of services, extension workers comprising the team or network are dispersed among the villages in the district. Generally there is not more than one extension worker per village and frequently one extension worker may cover more than one village (Gêmo, 2001).

Depending on availability of funds, the members of a team meet fortnightly and teams in a network meet monthly. There appear to be no regular provincial meetings of networks, but there is one annual national meeting of provincial services. Occasionally there will be provincial or national training programmes to which individual extension workers will be invited. The collaboration with research has basically been through periodic technology review meetings (REPETEs) in an annual schedule (Julião, 2004).

Extension workers advise farmers and demonstrate new technologies on the farmers' plots. They are also responsible for vaccination of poultry (village chickens) to control Newcastle disease, construction of improved granaries and for the construction of improved enclosures, mainly for goats (SPER Cabo Delgado province, 2004). Where the opportunity presents itself, an extension worker may collaborate with extension workers from the NGOs or private sector. This is generally not a planned or structured arrangement and is driven by the individuals involved (Julião, 2004).

In addition to the extension worker's technical role in agriculture, they are often required to assist with non-agricultural issues, such as water, health, education and other

development problems, because they are the most visible and available government representatives (Julião, 2004). Although extension workers will generally merely pass along information to the relevant ministry, often they will have to get directly involved with these non-agricultural issues simply because they are resident in the community and there is no one else to help (Julião, 2004).

2.2.4 Non-governmental organizations and private sector Rural Extension in Mozambique

About forty-six NGOs (mostly foreign NGOs, see Annexure 1) are reported to be operating in Mozambique alongside RE public sector services. According to MAP (1997) there is a great variation on the scale of operation of these organizations and the degree of integration of their activities with the SPERs. Three main groups of activities distinguish these NGOs from each other, namely (1) complementary activities with SPERs; (2) directly assisting the SPER; and (3) directly implementing extension activities where the State is not present (MAP, 1997).

Gemo & Rivera (2001) refer to the significant contribution of international NGOs together with UN agencies to the growth of public sector RE during the initial stages of extension development in Mozambique. In these initial stages, some NGOs such as the Association for International Cooperation (IBIS) a Danish NGO and the German Society for Technical Cooperation (GTZ) were either fully integrated with public sector RE or provided technical assistance and institutional support. However, these are isolated examples of collaboration between public sector RE and NGOs (Gêmo & Rivera, 2001). (See section 2.4.4 for further details).

On the other hand, private sector RE in Mozambique is provided by commercial farmers and private firms. RE is provided to producers and processors of export crops such as cotton, tobacco cashew nuts and coconuts (Amimo, 2004). The contribution of the private sector to the growth of RE in Mozambique is not significant although commercial approaches to agricultural extension were introduced through these firms. The most limiting factor faced by the private sector is the lack of financial resources, which has resulted in a number of private and commercial firms closing down (Amimo, 2004). The

relevant NGO and private sector providers will be discussed in more detail in the section on Cabo Delgado (Section 2.3.2).

2.3 Approaches to Rural Extension in Mozambique

This section looks at the approaches to RE in Mozambique introducing briefly the main features related to those approaches. It looks at this from the point of view of public extension and extension provided by the NGOs and the private sector.

2.3.1 Approaches to public sector Extension

The approach of public sector RE in Mozambique has been the transferring of technologies to farmers mainly through field demonstrations. The training and visit (T&V) approach has been the official extension system of the DNER since the establishment of RE in Mozambique in 1987 (Gemo & Rivera, 2001). The T&V approach system comprises a number of key elements (Swanson & Claar, 1984 and Birmingham, 1999):

- Regular training sessions for extension workers
- Training based on farmers' needs
- Intensive series of visits to farmer after training, on a fixed schedule
- Hierarchy of support (regular supervision, monitoring & evaluation)
- Demonstration of new technologies
- Clientele (mainly needy farmers) approached through identified target groups and contact farmers

The implementation of the T&V approach was investigated as a part of the survey conducted in Cabo Delgado. Section 4.6 discusses the results of that survey.

2.3.2 Approaches to non-governmental organisations and private sector

The most common approaches to RE by NGOs and private sector in Mozambique are commodity development or production system and participatory approaches. The commodity development and production system is a form inherited from the colonial system in many African countries (Swanson & Claar, 1984). In Mozambique, this

approach still is implemented by private firms and is engaged in the production of export crops, mainly cotton and tobacco, although the production system have changed from large plantations to small farm holdings. The extension worker, commonly called *capataz*, handles all aspects of technology transfer, namely input supply, technical messages and marketing. The quality demanded for commercial products dictates that the farmer produces by strictly recommended practices under the control of the *capataz* (Birmingham, 1999).

Participatory approaches have started to be launched throughout Mozambique, funded by NGOs in pilot projects. However, the eagerness for short-term results due to the pressure from funding agencies often results in short cuts that alter the initial objectives of these participatory approaches (Carney & Farrington, 1998). Nevertheless, NGOs introduced a variety of participatory approaches in Extension blend in Integrated Project Approaches or Rural Development Programmes. According to MAP (1997), this can be beneficial to public sector extension services, as it now has an opportunity to compare and evaluate the different programs and methods used.

2.4 Agricultural Extension in Cabo Delgado province

This section looks specifically at RE services in Cabo Delgado province. It initially gives a general overview of the basic geographical aspects of the province to provide an insight on the climate disposition and the availability of natural resources. After that, the paper sequentially describes; public sector RE; NGO/private sector RE; and the relationship between public and NGO/private sector RE providers based on the views and perceptions of key informants and substantiated with facts from the literature.

2.4.1 The basic geography of the Cabo Delgado province

Cabo Delgado province in the north of Mozambique lies between two rivers: the Rovuma River in the north, which separates Mozambique from the Republic of Tanzania, and the Lúrio River in the south. The Indian Ocean in the east and Niassa province in the west completes the borders. The province is divided into 16 administrative districts. The northern districts, which are Makonde and Mwani speaking, comprise Mueda, Muidumbe, Nangade, Mocimboa da Praia and Palma. The centre includes the districts of Meluco, Quissanga, Ancuabe, Macomia, Ibo and Pemba Metuge. Chiúre, Montepuez, Balama,

Namuno and Mecúfi are the southern districts. The predominant language in the centre and south is mostly Makua (Christie, 1996; Livro Branco dos Recursos Naturais da Provincia de Cabo Delgado, 2001).

According to the Köppen classification, Cabo Delgado has a rainy, tropical climate of savannah for most of the year. The annual rainfall averages between 800 and 1 200 mm. Cabo Delgado's vegetation comprises miombo woodland and associated forest types. Wooded dune thickets occur on the coast and baobab trees come close to some of the beaches (Livro Branco dos Recursos Naturais da Provincia de Cabo Delgado, 2001).

Cabo Delgado is basically a rural province with more than 90% of its entire population making their livelihoods through natural resources utilisation, mainly through farming and fishing activities (Christie, 1996). Agriculture is essentially rain fed, with the use of rudimentary tools (billhook and hoe) to slash and cultivate the land (Ribeiro, 2001). If new land is started, the slash and burn method is employed to clear the land. The *matani* (peasant farm) is the basic unit of agricultural land use and the social unit for the organization of the rural household's work. As common in the African society, the number and size of these units represents the degree of influence a person has regarding community decisions. Shifting cultivation is practiced among the poorer communities in hidden areas. However, this practice is gradually being abandoned due to population growth and resulting unavailability of land. Staple foods and some domestic cash crops include cassava¹, maize, sorghum, beans, rice, pigeon peas and groundnuts. Export cash crops include cotton, tobacco, cashew nuts, sesame, and paprika was introduced in some districts of Cabo Delgado by NGOs (Ribeiro, 2001).

Livestock production is presently not largely widespread in the Cabo Delgado province. However, some ruminant species like goats, pigs and cattle are found. Traditionally, families have poultry (mainly chicken), which is mainly used for ceremonies and as a source of income. NGOs such as Helvetas and German Agro Action (AAA) have been introducing animal traction in some districts of Cabo Delgado province which offer basic conditions for animal production in terms of pasture, water and absence of the Tsé-tsé fly.

¹ Cassava is the staple food in all north of Mozambique, dried and pounded before consumed.

Animal traction is used basically to cultivate the land and in some cases for transportation (SPER Cabo Delgado province, 2004).

2.4.2 Public sector Rural Extension

In Cabo Delgado province, public-sector RE networks are available in five of the 16 districts of the province. Key informants interviewed in preparation for the study indicated that the main cause for the incomplete coverage of all 16 districts by RE networks is the limited availability of financial and human resources.

As is the case throughout Mozambique, key informants indicated that extension workers in Cabo Delgado advise farmers and demonstrate new technologies in farmers' plots. They are also responsible for vaccination of village chickens, construction of improved granaries and the construction of improved animal enclosures (SPER Cabo Delgado province, 2004). As noted earlier, in addition to the extension worker's technical role in agriculture, extension workers in Cabo Delgado are often directly involved in addressing non-agricultural issues. The Key informants also confirmed that providing assistance with non-agricultural issues forms a significant part of their work/takes up a significant amount of their time. This seems to be a major constraining factor in the effective RE service delivery.

The survey also showed that the main approach to RE in Cabo Delgado is the T&V system. As noted earlier the T&V system is based on a number of key elements conceived to accomplish the objectives on its design by the World Bank (see key elements on section 2.2.1). However, as in many African countries where this system was not entirely successful (van den Ban & Hawkins, 1996), realities in Mozambique such as the availability of physical resources, adequacy of the RE approaches and farmer's behaviour have inhibited the way in which the T&V approach is implemented and practiced, thus limiting its full implementation. The different categories of inhibiting factors identified are described:

Resources: the implementation of T&V is dependent on the availability of adequate resources, management, and supervision of staff, intensive contact with farmers, training and linkage to research (Birmingham, 1999). The survey confirmed that most of those requests are not fulfilled in Cabo Delgado, therefore, affecting the implementation of the

T&V in Mozambique. Some of the resource limitations include inadequate transport, needed to implement the series of intensive visits to farmers; insufficient personnel to fulfil the hierarchical organization required to perform reasonably the T&V system; and inadequate input supply to farmers.

Farmers' needs: the survey highlighted that addressing farmers' needs is an important aspect of RE. However the survey also indicated that the training program of the DNER does not reflect farmers' needs. The DNER applies a rigid 'top-down' approach to RE, by designing the programmes for RE services in the province; by not incorporating on its programmes the seeking for solutions to farmers' long-standing problems; by managing centrally the human and financial resources available for RE; and by not updating, in a regular basis, its relatively fixed (unchanging) training agenda. The survey showed that this approach could be limiting both extension workers and farmers innovative capacity.

Constraints to adoption of demonstrated technologies: while the demonstration method is the main method used by extension workers to make technologies available to farmers, the study identified a number of factors constraining adoption:

- **Input supply:** The inputs required adopting the technologies disseminated such as pesticides, herbicides, fertilizers and seeds are either not available, available too late or are available at prices that the farmers can not afford.
- **Infrastructure:** Access to markets required by new crops or increased yield of existing crops is often difficult or impossible due to poor road conditions and/or inadequate transport.
- **Technology:** Technologies diffused are inappropriate for the level of subsistence agriculture practised in Cabo Delgado; therefore do not respond to farmers' needs.
- **Marketing:** Despite the liberalisation of prices adopted by the GOM, commodity prices in Cabo Delgado province are not competitive in the market due to constraints in transport, storage and quantities produced.

The survey ascertained that the RE work is also negatively affected by weather hazards, such as floods and droughts, which occasionally occur in the province.

2.4.3 NGO and private sector agricultural extension

According to Gêmo (2001), public sector RE and other extension services providers (for the most part NGOs) jointly develop their activities in districts, each one covering its geographical area. In Cabo Delgado, different NGOs cover different geographical areas according to their objectives and specific areas of intervention. NGOs also have the financial capacity, which are used to develop research programmes and training to its technicians and farmers. The fact that NGOs concentrate their efforts on given area of intervention makes them more effective than public sector RE. Public sector RE uses a holistic approach in relation to production systems envisaging to address farmers' needs (Gêmo, 2001). NGOs also have the financial capacity, which is used to develop research programmes and offer training to its technicians and farmers (Amimo, 2004).

The survey found that the majority of NGOs in Cabo Delgado province use participatory approaches. NGOs' approaches to extension are more problem-solving as demonstrated by the training in soil conservation techniques for extension workers and farmers, introduced by Helvetas (Switzerland Cooperation) in the southern districts of Cabo Delgado, to mitigate the growing problems of soil erosion. It was also noted that the staff complement in NGOs is generally less than 10 extension workers consisting of qualified technicians specialised in one specific area of intervention. The major NGOs operating in Cabo Delgado province and the kind of agricultural production and institutional support provided are listed in the Annexe 2.

2.4.4 The relationship between public sector and other Rural Extension providers

The survey noted that differences in philosophies among extension providers in Cabo Delgado explain the weakness on their relationship. It was also observed that there were few cases of coordination and collaboration among extension providers, whether public-NGO/private or NGOs/Private-NGO/private. The known situations of collaboration or coordination are:

- A coordinated geographical coverage of extension providers whether per district or per village, which increases the number of farmers assisted,

- The financial support provided by different NGOs to the SPER Cabo Delgado or district directorates of agriculture.

The survey also showed that there are no such organizational initiatives at provincial level to bring together RE providers despite policy efforts conceived at the national level.

Furthermore, as a State service provider, public sector RE seems to be in a more privileged position than other extension providers in terms of taking the lead of fostering partnerships among extension providers for example, arranging a forum of RE providers in the province. Respondents informed the survey that communities could adopt given technology more quickly if it is made available to them through extension workers from the public sector than from extension workers of other extension providers. Communities from the rural areas of Cabo Delgado, by and large, perceive the government as being fatherly and the main supplier of basic services. This is because during many years after Mozambique's independence, the GOM were the main provider of all services. NGOs, due to the financial availability used for input supply and other needs in the agricultural production, have been earning the farmers acceptance in recent years. There is no substantial contribution by the private sector to improve RE service delivery. So its relationship with other RE providers is not significant.

2.5 Conclusions and recommendations

The paper gave a general description of RE services in Mozambique and particularly in the Cabo Delgado province. It is believed that this study, although limited in exposure and scale, facilitate policymakers a better understanding of the genesis of RE work constraints for future well-taken decisions.

The historical overview of RE in Mozambique, the structure, the approaches and the policy environment affecting the agricultural development, showed that the majority of the constraints faced by these services result from:

- An inflexible 'top-down' approach to extension
- Inadequate public sector human and financial resources to effectively implement the T&V system
- Lack of coordination among RE providers in Cabo Delgado in terms of both programmes and mobilisation of resources.

A shift from the inflexible 'top-down' approach to locally tailored participatory approaches should be adopted to make RE more responsive to farmers' problems and opportunities. Farmers' participation in adapting technologies to their conditions should also be fostered through the dissemination of adequate and problem-solving technologies that are affordable to farmers, such as the low external input for sustainable agriculture (LEISA) system.

The inadequate public resources for RE and the lack of coordination among RE providers in Cabo Delgado are related issues. The key to resolving this coordination issues is forming strong stakeholder partnerships between and among the private, public and NGO RE providers. This would include:

- A shared vision for the outcomes of RE in Cabo Delgado
- An overall RE workplan/programme for Cabo Delgado
- A coordinated allocation and mobilisation of human and financial resources (to gain synergy as well as to eliminate duplication of expenditure)
- Coordinated management, monitoring and evaluation

Moreover, given that RE coverage is deficient due to human and financial limitations, the strategy should be to develop experience exchange between farmers from different locations to promote a horizontal farmer-to-farmer learning. Farmers should be involved in the planning and design of the RE programme. The strategy to draw involvement consists of introducing elements of farmer participation and group approaches into the RE service. However, a long-term solution should be prepared through the design of a unique national agenda for agricultural extension providers with the participation of all stakeholders in agricultural development.

Further research, whether conducted by the State, Universities and/or NGOs, should concentrate on adapting an appropriate approach for RE in Mozambique taking into account the existing resource limitations and the high levels of illiteracy among communities. More research should be done mainly with NGOs to inform the design of a unique national agenda for RE services in Mozambique.

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Annexe 2

List of the main NGOs operating in Mozambique

| | NGO | Country | Province | | | | | | | | | | |
|----|-------------------|---------------------------------|----------|---|---|----|---|---|---|----|---|----|---|
| | | | Mp | G | I | Mn | S | Z | T | Nm | C | Ns | |
| 1 | AAA | German | X | | | | | X | | | | X | |
| 2 | ACORD | Irish | | | | | | | | | | | X |
| 3 | Action Aid | British | | | | | | X | | | | | |
| 4 | ADCR | Local | | X | | | | | | | | | |
| 5 | ADIPSA | Danish | | | | | | | | | | X | |
| 6 | ADRA | USA | | | | | | X | | | | | |
| 7 | AGA KHAN | | | | | | | | | | | X | |
| 8 | AFRICARE | USA | | | | | X | | | | | | |
| 9 | APN | Ajuda Popular de Noruega | | | | | | | X | | | | |
| 10 | CARE | USA | | | | X | | | | | X | | |
| 11 | Caritas Diocesana | Mozambican | | | | | | | | | | | |
| 12 | CD | Cooperação para Desenvolvimento | | | | | X | | | | | | |
| 13 | Centro Kuchijinji | Local | | | | | | | | | | | X |
| 14 | CIDAC | Português | | | | | X | | | | | | |
| 15 | CCM | Conselho Cristão de Moçambique | | | X | | | | | | | | |
| 16 | CONCERN | Irish | | | | | | | | | X | | X |
| 17 | Clusa | Dutch | | | | | | | | | X | | |
| 18 | Crocevia | Italian | | | | | | | | | | | X |
| 19 | FHI | Fundação Contra a Fome | | | | | X | | | | | | |
| 20 | FML | Federação Mundial Luterana | | | X | | X | | X | | | | |
| 21 | FOS | Belgian | | | | | | | X | | | | |
| 22 | GTZ | German | | | | X | X | | | | | | |
| 23 | Helvetas | Swiss | X | | | | | | | | | X | |
| 24 | HIVOS | Swiss | | | | | | | | | | X | |
| 25 | IBIS | Danish | | | | | | X | | | | | |
| 26 | ICCO | Dutch | | | | | | | | | X | | |
| 27 | ISCOS | Italian | | | | | | | X | | | | |
| 28 | Karibu | | | | | | | | | | X | | |
| 29 | KULIMA | Mozambican | | | X | | | | | | | | |
| 30 | MOLISV | Italian | | | | | X | | | | | | |
| 31 | OIKOS | Português | | | | | | | | | | | X |
| 32 | ORAM | Mozambican | | | | | | X | | | | | |
| 33 | Padres Cupucinos | | | | | | | X | | | | | |
| 34 | PJM | Norwegian | | | | | | | | | | X | |
| 35 | Progresso | Mozambican | | | | | | | | | | X | X |
| 36 | Projecto ZOA | | | | | | | X | | | | | |
| 37 | REDD BARNA | Norwegian | | | | X | X | | | | | | |
| 38 | Sasakawa/SG2000 | | | X | | X | | | | | X | X | |
| 39 | STC | Save the Children | | X | | | | | | | | | |
| 40 | TROCAIRE | Irish | | | | | X | | | | | | |
| 41 | UGC | União Geral de Cooperativas | X | | | | | | | | | | |
| 42 | UNICEF | | | | X | X | X | X | | | | | |
| 43 | VETAID | British | X | X | X | | | | | | | | |
| 44 | WV | World Vision | | | | | X | X | X | | | | |
| 45 | WFD | | | | | | | | X | | | | |
| 46 | WWF | USA | X | | | | | | | | | X | |

Source: updated and adapted from MAP (1997)

Key to Provinces:

Mp – Maputo; G – Gaza; I – Inhambane; Mn – Manica; S – Sofala
Z – Zambézia; T – Tete; Nm – Nampula; C – Cabo Delgado; N - Niassa

Annexe 3

Most relevant NGOs operating in Cabo Delgado

Helvetas (Switzerland Cooperation)

Helvetas provides institutional support to district Directorates of agriculture in Chiúre, Namuno and Balama districts. Helvetas intervenes by facilitating communities to organise themselves through the establishment of *conselhos de desenvolvimento comunitário* [community development councils]. Other areas where Helvetas intervenes are Food Security, Land Tenure, Livestock promotion and NRM. Specifically in NRM, Helvetas are developing soil and water conservation in agricultural production, which is modelled on the Zimbabwean approach. This program has been assisted by expertise from Zimbabwe. The association of Helvetas with the Gestão Comunitária de Recursos Naturais [Community Management of Natural Resources], a local NGO is a remarkable initiative to conserve the natural resource base.

Aga Khan Foundation

Aga Khan foundation was established in Cabo Delgado in 2002. Aga Khan Foundation is running its activities in two coastal districts of Cabo Delgado namely Quissanga and Ibo in a project named Programa de Desenvolvimento Rural da Costa Litoral [Coastal Rural Development Programme]. The objectives of the Aga Khan Foundation include the protection of coastal resources and of biodiversity. The Aga Khan Foundation is also promoting Conservation Agriculture in the same districts.

World Wildlife Fund

The World Wildlife Fund (WWF) provided financial support for the establishment of the 7,500-km² Quirimbas National Park on June 6, 2002. The Quirimbas National Park is a recently established protected area in the Cabo Delgado province. The initiative, which was headed by the government of the province of Cabo Delgado, involved local NGOs dealing with NRM issues and was strongly supported by local communities. Besides the financial support at the establishment of the Quirimbas National Park, WWF is still providing support to help communities mitigate conflicts with wildlife and produce sufficient food. This support aims also at enabling communities to get some percentage of the Park revenue. The strategy adopted by WWF to attain these objectives is through conducting training courses for local communities in crucial issues such as creation and

management of marine sanctuaries to protect key habitats; human/elephant conflict management; and zoning plan for human livelihood activities and conservation.

Acção Agrária Alemã [German Agro Action]

The Acção Agrária Alemã (A.A.A) was focused in Livestock production. The A.A.A promoted training in animal traction and provided technical assistance for farmers in some districts of Cabo Delgado that have potential in livestock production. A.A.A also promoted the distribution of goats for small-scale producers to provide a source of income.

CHAPTER THREE

THE RELATIONSHIP BETWEEN AGRICULTURAL EXTENSION AND NATURAL RESOURCE MANAGEMENT IN CABO DELGADO PROVINCE NORTHERN MOZAMBIQUE

(Submitted for publication in the South African Journal of Agricultural Extension)

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Abstract

The study investigates the relationship between agricultural extension services and natural resource management in Cabo Delgado, the northern province of Mozambique. The results, which, can be inferred to all of Mozambique, recommend improvements both in natural resource management and agricultural extension service delivery.

A semi-structured questionnaire was used to collect data from a randomly selected sample of 100 farmers drawn from four southern districts of the Cabo Delgado province. The questionnaire tried to find out about farming characteristics, land tenure, farmers organizations, the relationship between existing farming practices and agricultural extension in Cabo Delgado and training in natural resource management issues. The data was empirically analysed.

The study showed that the foundations for a sound relationship between agricultural extension services and natural resource management are weak. The farmers' willingness to adopt and implement new or improved natural resource management practices disseminated by the agricultural extension services are constrained mainly by i) their inappropriate preparation in terms of training and technology adoption adaptive mechanisms ii) inadequacy of the agricultural extension programmes, and iii) the 'top-down' approach to agricultural extension.

The study recommends that agricultural extension should revise its programmes to include useful information such as land tenure administrative procedures that would support farmers on establishing property rights over the land to increase their investment; and to promote farmers groups. Strategies to make available to farmers, at lower costs, information of inexpensive technologies and market developments should be adopted.

3.1 Introduction

Effective natural resource management (NRM) requires effective strategies to be attained. One of the strategies broadly used, mainly in developing countries, is the use of agricultural extension services (in Mozambique called rural extension, RE) to translate into

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action government objectives related to agricultural production in particular and NRM in general (van den Ban and Hawkins, 1996). The term NRM in this study refers to the improved management of natural resources basically land, water forests and wildlife (for further explanations on NRM see 3.1.2 in this article). Therefore, RE has an important role to play for effective NRM by disseminating improved technologies required for a society to conserve, protect, rehabilitate, and manage its land, water, and other natural resources as well as to facilitate relative resource management and decision making processes among farmers (Contado, 1997).

In Mozambique, RE services relate to NRM through a policy framework enhancing the role of RE to promote improved NRM. RE services inform farmers, developing knowledge in new production technologies and in market developments among farmers' communities. By investigating the relationship between RE and NRM in Cabo Delgado province, the study aims at identifying tools that can be used to design strategies to strengthen the foundations for agricultural and rural development.

This study consisted of a survey carried out in the Cabo Delgado province that involved 100 farmers randomly selected from four southern districts namely Chiúre, Montepuez, Balama and Namuno. Despite of its limited scope and coverage, it is believed that the findings of this study will enable the evaluation of the RE programme in Cabo Delgado and of the relationship between RE and NRM. The findings of this study will also inform future decisions regarding both RE and NRM.

3.1.1 Agricultural development and Extension

The agricultural extension service is generally accepted as the most important way by which rural people can be assisted to develop their economies by means of developing their agriculture (Jones, 1986; van den Ban & Hawkins, 1996). The main task of agricultural extension services in developing countries is to promote improved food security and to support local livelihoods (van den Ban & Hawkins, 1996).

It is recognised by national governments and international agencies (donors) that development, mainly of developing countries, initially involves development of rural areas (Korten, 1990). Consequently, the mission of agricultural extension services in developing

countries should concentrate on promoting a sustainable use of natural resources for the development of agriculture and the rural economy. These facts make it important to investigate the relationship between agricultural extension services and NRM in order to provide information that can enlighten future decisions regarding agricultural development.

3.1.2 Natural resource management - concept and approaches

NRM is defined as the management of prospective and comprehensive impacts of people on the environment with the purpose of attaining ecological sustainability and maintaining the biodiversity (Uphoff, 1998). The general objectives of NRM are associated to two important policy goals: conservation of the natural resource base and agricultural or rural development (Uphoff, 1998). Regarding the utilisation of natural resources, the NRM is used for the following purposes: conservation; environmental management; resource conservation, and resource restoration (Uphoff, 1998).

The realisation that NRM needs peoples' participation has evolved this concept to new concepts namely 'Community-Based Natural Resource Management' (CBNRM) and 'Integrated Natural Resource Management' (INRM). The idea in CBNRM is to increase the responsibility in local communities towards NRM by raising on them the sense of ownership (Uphoff, 1998) and in INRM the idea is to effectively approach social and economic issues through NRM (Hagmann *et al*, 2002)

3.2 Problem statement

The existing policy framework in agricultural development in Mozambique underlines the need for improved NRM. To illustrate this fact, the objectives of the National Programme for Agricultural Development (PROAGRI), comprises of improvements of the knowledge base of farmers communities in terms of improved use of available resources e.g. land, water, forest, animal and labour force (MAP, 1997). The government of Mozambique (GOM) is concerned with how to improve the livelihoods of family sector producers, but there is no clarity on the extent to which NRM issues should be addressed e.g. at the district level. This then results in sporadic consideration of key issues, such as training in terms of NRM improved practices; the conservation of the physical natural resource; the research-extension linkage; land tenure; and building local capacity for effective NRM. Presently,

agricultural extension in Mozambique appears to be in a good position to play an important role to promote sustainable NRM practices due to factors like experienced field staff and the huge credibility of these services among farmers.

New approaches to natural resource conservation across southern Africa, supported by governments and donors, recognize that conservation goals and rural development are based upon involving local people (Ribeiro, 2001; Haggmann *et al*, 2002; and Nhantumbo *et al*, 2003). These approaches involving local people have been thriving all over the region and have resulted in the establishment of a number of CBNRM initiatives. For instance, Nhantumbo *et al* (2003) list some positive results with CBNRM in Namibia, Botswana, Zimbabwe and Zambia. However, these approaches in NRM, in many situations, fail to integrate these community-based initiatives together with extension and research, making it hard for communities to be committed to new development initiatives.

It is a fact that communities, by nature, tend to protect and conserve their surroundings. However, farming practices are influenced by other factors (e.g. pricing policies and marketing structures) which often overrule good NRM. Further, communities are not the only role players in the development scenario. For example, 'outsiders' (e.g. timber companies operating in rural areas) do not share the same values and objectives of local communities. This also impacts on NRM conservation (Ribeiro, 2001). In these complex livelihood systems, communities will never progress without adequate facilitation and support to maintain their values, as well as to improve their livelihoods through the use of these resources. Contrarily, they can become a source of destruction of natural resources by uninformed and poor management.

Community-based initiatives, such as a rural development strategy, have been embraced by the GOM to devolve, to some extent, the control over natural resources to the local communities (Nhantumbo *et al*, 2003). However, these initiatives lack adequate facilitation by service providers to be successful. CBNRM and INRM will not be analysed separately in this study. The problem is on how CBNRM and INRM translate into implementation. What appropriate practices can be disseminated by extension services in order for local people to obtain economic benefits from the vast natural resources of the country without exhausting them? How can community rights and responsibilities be known and followed by them? How could other communities in other locations share this community

knowledge? Again, these questions will not be analysed, as this study does not question the policy framework in Mozambique.

The current study aims at creating awareness on the need for the integration of RE services on community-based initiatives like the CBNRM to facilitate its implementation and collaboration with other development programmes at local and national level. Thus, the study investigated:

- Existing farming in terms of:
 - a) Farming characteristics,
 - b) Land tenure, and
 - c) Farmers organizations;
- Farming practices and its relationship with RE;
- Training in NRM issues.

The items investigated are expected to provide a picture of the current situation of the relationship between RE and NRM in Cabo Delgado province.

3.3 Brief description of the study area

Cabo Delgado is one of Mozambique's most northern provinces. Cabo Delgado is consistently warm and, according to the Köppen classification, enjoys a rainy tropical climate of savannah for most of the year (Livro Branco dos Recursos Naturais da Provincia de Cabo Delgado, 2001). May/June to October/November is the driest season while November/December to April/ May is the rainy season. The annual rainfall averages between 800 and 1 200 mm. Temperatures average 26°C in the rainy season and 23.5°C during the driest season (Livro Branco dos Recursos Naturais da Provincia de Cabo Delgado, 2001).

Cabo Delgado is basically a rural province characterized by smallholdings. The average land holding unit is 1.75 hectares (ha) and people generally hold more than one unit (INE, 1999). Agriculture is basically rain fed, with the use of rudimentary tools (billhook and hoe) to slash and cultivate the land. If new land is cleared for the agricultural production, the slash and burn method is employed. Farming systems in Cabo Delgado include

commercial crops (maize, beans, groundnuts, rice, sesame and vegetables); and subsistence crops production (cassava, maize, beans, sorghum and tubers) (Ribeiro, 2001).

Natural resources found in Cabo Delgado include terrestrial and marine components. The terrestrial component consists of extensive arable land; forests and wildlife, while the marine component comprises a diversity of fish resources, coastal forests, mangroves, coral reefs and sea grass beds (WWF, 2002). Cabo Delgado is considered to be one of the provinces in Mozambique with a great potential for forest production. Forest resources comprise miombo woodland and associated forest types dominated by three genera of legume family namely *Brachystegia*, *Julbernardia* and *Isobertia* (Ministry of Industry and Commerce, undated).

In Cabo Delgado, RE services are provided by the State, NGOs and the private sector. Public sector RE services are the mostly represented by the employment of about eighty-five extension workers through five extension networks. Each extension network comprises between eight and twenty-four extension workers. Public sector RE uses the Training and Visit (T&V) approach while NGOs apply participatory approaches. The private sector use commercial forms of RE, however, it is not widespread in the province (Amimo, 2004; Gêmo, 2001).

3.4 Methodology of the study

The study was conducted in Cabo Delgado province in the north of Mozambique. It was planned to cover all districts with public sector RE networks; however, due to logistic constraints the research was conducted only on the southern districts of the province. For this reason, Mueda in the north was not included. A survey was conducted among four hundred and eleven farmers in four districts of the province namely Chiúre, Montepuez, Balama and Namuno (see Table 3.1). Of those four hundred and eleven farmers, twenty-seven farmers were key informants identified by the relevant District Directorate. It was necessary to start with key informants to gain the confidence of other farmers who were otherwise reluctant to participate in the survey. This fact created a clustering of respondents per village in a district biasing the results in reason of the small and unbalanced district sampling. To eliminate bias originated with this clustering of respondents, a percentage of the farmers interviewed per district in proportional basis to

the total number of farmers surveyed were considered. This arrangement resulted in approximately hundred questionnaires, which were randomly selected for analysis from the total number of questionnaires (see Table 3.1). For the same purpose of eliminating bias, data were not analysed per district. Furthermore, because women are not allowed to express their views to ‘outsiders’, only men were accessed. This gender issue illustrates clearly how issues such as taboos and social exclusion can influence negatively the rural development by excluding women from developmental processes in the community

Table 3.1: Number of respondents per district

| Districts | Number of farmers interviewed | Number of randomly selected questionnaires analysed per district |
|------------------|--------------------------------------|---|
| Chiúre | 169 | 42 |
| Montepuez | 127 | 30 |
| Balama | 35 | 10 |
| Namuno | 80 | 18 |
| Total | 411 | 100 |

A semi-structured questionnaire was used to investigate the farming characteristics, farming systems in practice, land tenure, RE and technology development, practices in NRM disseminated by the RE, farmers’ organizations and training in NRM issues. The researcher, in a face-to-face method to overcome problems of farmers’ illiteracy, filled in the questionnaires. The data were compiled and converted to percentages to facilitate a comparative analysis.

3.5 Results and discussion

This section covers five research areas: farming characteristics; land tenure; farmers organizations; farming practices and their relationship to Rural Extension; and training in NRM issues.

3.5.1 Farming characteristics

Substantiating the literature review (INE, 1999 and Ribeiro, 2001), the survey showed that agriculture in Cabo Delgado is characterised by smallholdings and the use of hand tools to slash, cultivate and plant. Among the chosen sample of 100 respondents in the four districts accessed, the cultivated area averages 1.5 hectares (ha). The biggest land holding

is 4.5 ha and the smallest is 0.5 ha. However, the majority of the respondents (78%) have land holdings with 1.5 ha or more. All respondents have more than one land holding in different locations as a strategy to distribute the risk of lower yields or losses due mainly to pests and weather hazards. All respondents practise intercropping or multiple cropping. Combinations of crops include mainly cassava or maize with groundnuts or cassava or maize with cow peas/beans. Cassava and maize are the staple food in all of the districts surveyed as all the respondents ensured to the survey. It explains their presence in all the intercropping combinations mentioned above.

Respondents said that extension workers either from public or NGOs/private sector visit them twice a month, on average. It in part explains the reason that some practices disseminated by RE services such as planting seeds in rows and use of the right spacing between plants according to crop varieties are widespread in the districts surveyed with significant positive results. The existing farming system became a combination of new practices and technologies disseminated by extension with practices based on the local knowledge.

3.5.2 Land tenure

In the preparation of the survey, key informants at the provincial level revealed that people in Cabo Delgado, whether individually or collectively, usually do not have land titles. The survey confirmed this fact showing that none of the respondents have completed the legal administrative procedures to obtain the individual land title legislated in Mozambique (the Land Law of 1997 states that all land belongs to the State which can give land titles or land use rights to individuals or groups according to occupancy rights). (78%) of the respondents stated that the reasons for the lower rate of individual land titles were the complicated legal administrative procedures in which (69%) among those also have financial constraints. Thus, almost all respondents (96%) occupy the land through the right of occupation given in the new Land Law (more than 10 years of continuous use). Six respondents (two from Chiúre and four from the Montepuez districts) have group tenure (collective titles), and are farmer associations' members.

The survey also showed that (83%) of farmers interviewed do not have sufficient information about the laws governing the land ownership in Mozambique. They have limited information on the procedures to obtain land titles.

3.5.3 Farmers organizations

There were a small number of respondents (6%) who said they were part of a farmer organization. The survey revealed that farmers associations in Cabo Delgado province are infrequent or, if existing, have not resulted from local initiatives. Officers at the Provincial Directorate of Rural Extension informed the survey that the most part of farmers' associations existing in Cabo Delgado were organized by private firms involved in cotton production to facilitate input supply to farmers (distribution of seeds and pesticides; synchronization of technologies among farmers and commercialisation). These sources further explained that these associations are restricted to cotton production. The survey, however, accessed that Public Sector RE has included the promotion of farmers associations on its annual planning of the 2005 season.

3.5.4 Farming practices and their relation to Rural Extension

A pre-coded question included in the questionnaire investigated the different farming practices disseminated by RE services in Cabo Delgado province. The question attempted to find out which of the listed practices (see Table 3.2) were already known and implemented by farmers before these practices were disseminated by RE services. It also attempted to find out farmers' reasons for not implementing farming practices disseminated by RE services. The results are set out in Table 3.2.

Table 3.2 shows the different farming practices seen in Cabo Delgado province and the relative number of farmers implementing these practices among the sample of respondents. The huge number of farmers implementing practices associated with soil conservation is explained by the fact that these practices are disseminated both by the public sector and the NGOs/private sector RE, therefore, more farmers were reached. It is also explained by the fact that farmers must be concerned to the decrease in yields due to soil degradation and pests, a fact that generated more interest in attending to related technology developments as explained by (56%) of respondents.

Table 3.2: Farming practices and adoption farmer respondents (n=100)

| Farming practice | RESPONDENTS IMPLEMENTING (%) | | Respondents not implementing (%) |
|---|------------------------------|-----------|----------------------------------|
| | Through RE | Before RE | |
| Zero tillage or minimal tillage | 67 | 6 | 27 |
| Terracing | 19 | 0 | 81 |
| Tied ridges | 36 | 0 | 64 |
| Crop rotation | 0 | 100 | 0 |
| Use of cover crops/green manure | 30 | 63 | 7 |
| Intercropping or multiple cropping | 0 | 100 | 0 |
| Control of pests | 83 | 56 | 0 |
| Row seedling | 89 | 0 | 6 |
| Combination of legume trees with food crops | 11 | 56 | 33 |
| Combination of trees with pasture | 0 | 6 | 94 |
| Shifting cultivation | 0 | 100 | 0 |

The survey showed that RE services in the province use a diversity of methods such as field demonstrations, technological messages, training and experience exchange with other communities, to make these practices, listed in Table 3.2, known to farmers. Practices such as crop rotation, intercropping or multiple cropping and shifting cultivation were shown to be part of the local knowledge. However, respondents informed the survey that the population growth and consequent pressure over the land have seen practices like shifting cultivation being reduced. Some practices in conservation agriculture (e.g. agro forestry) are also used in some locations. However, the use of these practices in many situations seems to be unintentional as farmers are not able to explain the reason for its use. On the other hand, respondents said that they are aware of the advantages of practices such as terracing and tied ridges. These farmers do not implement these practices because the practises are expensive and require additional labour cost that they cannot afford. Respondents said to combine traditional methods of pest control with the conventional, i.e. they use one or another method alternatively. They recognize the conventional methods as being introduced through RE services. However, before those methods were introduced through RE they typically were controlling pests using peri-peri, ashes, salt and remedial plants.

3.5.5 Training in natural resource management issues

According to respondents, training for farmers, mainly by public sector RE services, is infrequent in Cabo Delgado province. However, the survey findings showed that NGOs have been playing an important role on the agricultural development of Cabo Delgado province by incorporating in its programmes training for solving farmers' long-standing problems. Therefore, from the farmers interviewed 78% were trained through training opportunities provided by NGOs. These respondents stated that they have been trained in issues that they had previously presented as constraining their production activity (see Table 3.3 for training issues). They also stated that training in soil conservation techniques was conducted by experts from the Republic of Zimbabwe invited by an NGO operating in Cabo Delgado province. Key informants informed the research that Extension Network supervisors of Chiúre and Namuno districts visited Zimbabwe for experience exchange in areas related to NRM including soil and water conservation.

Table 3.3: Training in NRM issues and attendance by farmer respondents (n=100)

| Training issues | Respondents trained (%) | Respondents not trained (%) | Respondents not answering the question (%) |
|--|--------------------------------|------------------------------------|---|
| Soil conservation techniques | 90 | 4 | 6 |
| Land tenure procedures and conflict management | 46 | 54 | 0 |
| Pest management | 80 | 20 | 0 |
| Management of forests and wildlife | 5 | 92 | 3 |

Table 3.3 describes the main issues comprising training and the relative degree of farmers' participation. The information in Table 3.3 shows that soil conservation techniques (90%) and the pest management (80%) had the major attendance by farmers. This is explained by the fact that these issues dominated the training agenda as farmers as the main constraints to crop production have listed them. However, as in Table 3.2, this fact is again explained by the farmers' concerned with the decrease in yields due to soil degradation and pests. Contrarily, management of forests and wildlife is the training issue lesser attended by farmers (92% of respondents did not attend). The reason for this seems to be the fact that

southern districts of Cabo Delgado province, where the survey was conducted, are not overly populated by wildlife (mainly elephants and lions). Therefore, this issue is not of concern to farmers.

3.6 Conclusions and recommendations

The results of the study show that the relationship between RE services and NRM is weak. Farmer communities are willing to adopt and implement improved NRM practices disseminated by the RE services. However, they find it difficult to do so because they lack appropriate preparation in terms of training and adaptive mechanisms to incorporate these practices into existing farming system. Moreover, the RE programme is not adequate for responding to the needs of communities at the local level. Because farmers' problems differ in each province, the 'top-down' approach to RE appears to be inadequate to respond to local needs and therefore attract farmers' interest in RE activities. RE should update its programmes to include useful information, such as land tenure administrative procedures that would support farmers in establishing property rights to land. This, in turn, can boost the farmers' willingness to increase their investment in the land.

Further, financial resource limitations in the public sector RE services are probably the major reason for the absence of farmers' training in NRM issues. The key to resolving this training issue should be to elevate the levels of training for extension workers so that they acquire an appropriate training capacity. This would enable them to effectively deliver on-farm training for farmers after they have been trained on aspects related to NRM.

Farmers' participation in NRM should also be promoted by bringing farmers together in associations for production, input supply and marketing chains.

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Annexe 4

Questionnaire

(Farmers)

This questionnaire relates to all farmers in Cabo Delgado Province northern Mozambique. Farmers refer to both male and female individuals that have cropland. The information provided here is strictly confidential and will be used for research purposes only. It is kindly requested your collaboration.

Instructions

Mark with (X) in the box in front of your appropriate response and write an appropriate answer on the provided space. You can mark more than one box if is the case.

Geographic position in the Province 1. North 2. Centre 3. South

District -----

Ward No -----

Section 1: Personal information

Name: -----(Optional)

Sex 1. Male 2. Female

Age: -----

Section 2: Farm Characteristics

2.1 How many land holdings do you have? -----

2.2 what is the approximate size of your land holding? (If there is more than one give the approximate size of the biggest one). ----- (Specify units)

2.3 Are you satisfied with this/those land(s) holding(s)? 1. Yes 2. No

If yes, what are the reasons

1. Fertile soils 2. Close to the house 3. Close to tar road
 4. Close to the river 5. Free from animals attack 6. Low erosion

7. Generally high productivity 8. Others Explain (only No 8) -----

If no, what are the reasons

1. Soil infertility 2. Far from house 3. Far from tar road
4. Far from the river 5. Animals attack 6. Erosion
7. Generally low productivity 8. Others (Explain only No 8) -----

2.4 Under what system do you have access to your land?

1. Individual title 2. Communal title 3. Right of occupation by use
4. Others (Explain only No 4) -----

2.5 Please explain why are you using the land under that system? -----

Section 3: Agricultural Production And Existing Farming Systems

3.1 Which crops do you usually grow?

1. Cassava 2. Maize 3. Cow peas 4. Sorghum 5. Rice
6. Groundnuts 7. Velvet beans 8. Cotton 9. Sesame
10. Pigeon pea 11. Squash 12. Taro 13. Garden vegetables
14. Cashew nuts 15. Others -----

3.2 Indicate the main purpose for growing these crops.

| Crops | Purpose | | |
|-----------------------|---------|--------|------|
| | Food | Market | Both |
| 1. Cassava | | | |
| 2. Maize | | | |
| 3. Cow peas | | | |
| 4. Sorghum | | | |
| 5. Rice | | | |
| 6. Groundnuts | | | |
| 7. Velvet beans | | | |
| 8. Sesame | | | |
| 9. Pigeon pea | | | |
| 10. Squash | | | |
| 11. Taro | | | |
| 12. Garden vegetables | | | |
| 13. Cashew nuts | | | |

3.3 What from the following production systems do you use in your field?

1. Monoculture 2. Intercropping

3.4 (In case of Intercropping) which crops do you usually intercrop?

3.5 Why are you using monoculture? -----

3.6 Why are you using intercropping? -----

3.7 How do you prepare the land for planting?

Previously unplanted land

1. Tractor 2. Animal traction 3. Hoeing 4. Slash and burn
5. Just burn 6. Just slash

Previously planted land

1. Tractor 2. Animal traction 3. Herbicides 4. Hoeing
5. Slash and burn 6. Just burn

3.8 Why are you using this method -----

3.9 How do you control pests?

1. Agrochemicals 2. Biological 3. Traditional pesticides
4. Others (Explain) -----

3.10 How do you control weeds?

1. Agrochemicals 2. Manual 3. Others (Explain) -----

3.11 What do you do with the green manure from the crops?

1. Burn 2. Leave on the field 3. Throw away 4. Others
(Explain) -----

3.5 What kind of fertilizers do you use to improve soil productivity?

1. Agrochemicals 2. Animal manure 3. green manure 4. None

Section 4: Agricultural extension and technology development

4.1 Can you get farming information whenever you need it? 1. Yes 2. No

If yes, where do you get it?

1. DDADR 2. Extension workers (DDADR, NGOs) 3. Other farmers

4. Other -----

4.2 How many visits do you receive from the extension worker monthly? -----

4.3 How many times (average) do you contact the extension worker monthly? -----

4.4 Regarding the management of natural resources, what information messages do the extension worker provide to you? (thick on the squares)

- | | |
|--|------------------------------|
| 1. Importance and techniques for soil conservation | (1) <input type="checkbox"/> |
| 2. Importance and techniques for water harvesting | (2) <input type="checkbox"/> |
| 3. Importance, preservation and benefits of forests and wildlife | (3) <input type="checkbox"/> |
| 4. Procedures for land registration and conflict avoidance | (4) <input type="checkbox"/> |
| 5. Importance, benefits and management of parks and reserves | (5) <input type="checkbox"/> |
| 6. Pest management | (6) <input type="checkbox"/> |
| 7. Importance and use of leguminous tree species | (7) <input type="checkbox"/> |
| 8. Importance of crop rotation, green manure cover crops, zero or minimal till | (8) <input type="checkbox"/> |
| 9. Detriment of intensive burning practice for the soil and vegetation | (9) <input type="checkbox"/> |
| 10. Others (please list) ----- | |

4.5 In the following table the information messages from 4.4 are the same however represented by the particular number in brackets. What of those practices are being implemented and what are not; and what were learnt through rural extension or before rural extension disseminated the practice.

| Practices | Implemented | | Not implemented |
|-----------|-----------------|------------------------|-----------------|
| | Rural extension | Before rural extension | |
| (1) | | | |
| (2) | | | |
| (3) | | | |
| (4) | | | |
| (5) | | | |
| (6) | | | |
| (7) | | | |
| (8) | | | |
| (9) | | | |
| (10) | | | |
| (OTHER) | | | |
| (OTHER) | | | |

4.6 For the same practices explain briefly why are you not implementing?

- (1)-----
- (2)-----
- (3)-----
- (4)-----
- (5)-----
- (6)-----
- (7)-----
- (8)-----
- (9)-----
- (10)-----
- Others-----

4.6 What other reasons prevent you from adopting farming practices recommended by agricultural extension? -----

- 1. Doesn't recognize the problem 2. Doesn't have resources
- 3. When the problem is known, doesn't know how to select the appropriate solution
- 4. Doesn't know how to obtain resources 5. Can't obtain credit
- 6. No motivation 7. Others (Explain) -----

Section 5: Training and Natural Resource Management

5.1 Have you attended training in natural resource management? 1. Yes 2. No

If yes, what was it about? (please list the issues considered)-----

5.2 Where the training team were from? 1. NGOs 1. DDADR
3. Others

5.3 How were you selected for that training?-----

5.4 Do you think training in natural resource management is important? 1. Yes 2. No
Why? -----

5.5 What kind of problems do you face in your land holding?

1. Soil infertility 2. Water unavailability 3. Soil erosion
4. Pests and plant diseases 5. Generally not productive 6. Others -----

5.6 How do you solve these problems? -----

5.7 What kinds of farmers' organizations are there in your village that promote improved natural resource management practices among the community?

1. Farmers' associations 2. Cooperatives 3. Others -----

5.8 Do you belong to some of these organizational forms? 1. Yes 2. No

What do you do in that organization? -----

What does that organization do for you? -----

1. Weekly 2. Monthly 3. Quarterly 4. Semester
5. Annually

5.10. Do you belong to other kind of farmers associations (for

5.10 Are there any 'outsider' organisation operating in the district? 1. Yes 2. No

5.7 What kind of organisation? 1. NGOs 2. Timber companies
 3. Private firms 4. others Explain (only n^o 4) -----

5.11 Explain how do you relate to them?

NGOs -----

Timber companies -----

Private firms -----

Others -----

Section 6: Credit and Marketing

6.1 What kind of inputs do you usually demand in your field activities?

1. Tractor 2. Animal traction 3. hoe and catana
 4. Herbicides 5. Pesticides 6. Fertilizers 7. Seeds
 8. Others -----

6.2 From where do you get these inputs?

1. Village traders 2. Farmers' associations or cooperatives 3. NGOs
 4. Others -----

6.3 Do you process any of your agricultural production? 1. Yes 2. No

If yes, how are these products sold?

| Agricultural product | Processed and sold as | Where sold |
|-----------------------------|--|---|
| Maize | Milled grain, corn flakes, <i>maheu</i> , alcoholic drinks | Village market, sports venues, taxi rank |
| Sorghum | Alcoholic drinks | Village market |
| Cassava | Cooked, Cut and dry | Village market, sports venues, taxi rank, traders |
| Groundnuts | Toasted | Village market, sports venues |
| Cashew nuts | Toasted | Village market, sports venues, taxi ranks |
| Cow peas | <i>Badjias</i> | Village market, sports venues, taxi rank |
| Sesame | Cooking oil | Village market, taxi rank, traders |

6.4 How do you finance your crop each year?

1. Own reserves 2. Sale of previous crops 3. Loans

4. Others -----

6.5 If you make use of loans, where do you get it?

1. Bank 2 Government lenders 3. Private lenders 4. Neighbours

5. Relative and friends 6. Other -----

6.6 Do you belong to some kind of organisation? (association of marketing, commercialisation, input supply)

Section 7: Additional Information

7.1 Please provide any general comment regarding natural resource management in your village. -----

7,2. What do you think rural extension would do to improve natural resource management?

7.3 What do you think you are missing to do to improve natural resource management?-----

7.2 Please recommend about improved practices in natural resource management that you know and would like to see widespread? -----

Thank you very much for your co-operation

CHAPTER FOUR

CONSTRAINTS AFFECTING THE ABILITY OF AGRICULTURAL EXTENSION TO IMPROVE NATURAL RESOURCE MANAGEMENT IN FOUR DISTRICTS OF CABO DELGADO PROVINCE IN NORTHERN MOZAMBIQUE (Submitted for publication in the South African Journal of Agricultural Extension)

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Abstract

This paper examined the main constraints affecting the ability of agricultural extension to improve the management of natural resources in Cabo Delgado province. The review of the extension system in Mozambique revealed existing resource limitations and lack of effective delivery mechanisms in the agricultural sector, which affects the national extension system itself. A survey carried out to investigate the relationship between Agricultural Extension and Natural Resource Management assessed constraints hampering that relationship. The survey consisted of a semi-structured questionnaire conducted in districts that have public sector extension networks. It involved 55 (63.5%) of the total number of public sector extension workers in the province. Lack of coordination among extension providers, weakness in the research-extension linkage, limited availability of logistics and lack of motivation among extension workers are the most quoted constraints affecting the Agricultural Extension and Natural Resource Management relationship. An empirical analysis of data was used. Despite the strong agricultural extension human resource component mainly at the field level, the majority of the constraints identified are related to policy issues, therefore not in complete extension workers' domain.

4.1 Introduction

This paper analyses constraints affecting the ability of Agricultural Extension (called Rural Extension in Mozambique, RE) to improve natural resource management (NRM) in four districts of Cabo Delgado province in northern Mozambique. The paper starts by establishing the setting of Cabo Delgado province in terms of geographic location, population, agriculture and existing natural resources. After that, the paper introduces the extension system implemented in Mozambique and the approach adopted to agricultural extension namely the Training and Visit (T&V) approach. Then the paper establishes important concepts used for the purpose of this study, namely RE and NRM, before

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presenting the results of the study. Finally, the paper advances conclusions and recommendations to address the constraints identified.

4.2 Geographic facts from Cabo Delgado province

Cabo Delgado province is located in the north of Mozambique, neighbouring on the Republic of Tanzania as its northern boundary. The other provincial borders are the Indian Ocean in the east and two other provinces in the west and south namely Niassa and Nampula respectively. With an estimated population of 1,469,622 inhabitants, the province is essentially rural and most of the population are subsistence farmers or fish folk (Christie, 1996). Approximately 90% of agricultural smallholders produce cassava, maize, beans and groundnuts as the main staple foods and cashew nuts, cotton and recently sesame for commercial purpose. According to estimations from Mozambique's National Directorate of Forestry and Wildlife for 2003/2004, Cabo Delgado figures as one of the provinces with the greatest potential in forest density together with Niassa, Sofala and Zambézia. Natural resources include arable land, forests, wildlife and marine resources. Timber exploitation is widespread in the province (Ministry of Industry and Commerce, undated; Livro Branco dos Recursos Naturais da Provincia de Cabo Delgado, 2001; WWF, 2002).

4.3 The extension system in Mozambique and its approach to natural resource management

The training and visit (T&V) approach has been used since the establishment of RE services in Mozambique (Gêmo & Rivera, 2001). Existing resource limitations, however, have modified this system to a more 'top-down' and centralized approach. NGOs and the private sector, through participatory approaches, have also been contributing to the modification of the T&V by introducing new ways of dealing with farmers' problems. The government of Mozambique (GOM) has reformulated its policies envisaging improvements in NRM and service delivery. This reformulation intends at ensuring that RE services effectively take action in response to farmers' problems. The MADER [Ministry of Agriculture and Rural Development] is the institution responsible for agricultural affairs and the DNER is the directorate in the ministry, which is responsible for RE services. The Extension Master Plan of 1997 (MAP, 1997) is one of those GOM policies that reflect the eagerness of the national extension system to respond to the stagnation of agricultural services during sixteen years of civil war.

According to MAP (1997) the twofold objective of the Extension Master Plan, in line with the major objectives of the Agricultural Policy and of the National Programme for Agricultural Development (PROAGRI), is (a) to improve the local knowledge of the producers in terms of improved use of available resources (land, water, forest, animal and labour force) and (b) to strengthen and increase the capacity to implement the extension program. In addition, recognizing the limited institutional capacity of the ministry and the limited availability of financial resources to implement the activities, it aims at strategically maximizing the contribution of all extension providers (State, NGOs and Private Sector) in responding to the needs of the large number of producers (MAP, 1997).

Despite the clarity of the objectives prescribed in the Extension Master Plan and other agricultural policies, its achievement is constrained by a number of factors. These factors include socio-economic factors such as the low level of technology adoption among farmers (Ekoja, 2004) and financial resource limitations. Most importantly however is the lack of effective delivery mechanisms in the agricultural sector (Ribeiro, 2001), which affects the national extension system in Mozambique.

4.4 Meanings and concepts

This section gives the meaning of the term 'Extension' as perceived by different authors and as applied in Mozambique. Also, the issue of sustainability is questioned, as its applicability is not delivering good results mainly in development programmes related to NRM.

4.4.1 The meaning of Extension

The meaning of the term extension, in many situations, is established according to the ways different people in agricultural development are influenced (van den Ban and Hawkins, 1996). Accordingly, diverse perspectives are included in the concept of RE. These perspectives can be synthesized into five goals (a) transferring knowledge from researchers to farmers; (b) advising farmers in their decision-making; (c) educating farmers to be able to make similar decisions in future; (d) enabling farmers to clarify their own goals, possibilities and to realize them; and (e) stimulating desirable agricultural developments. The concurrent realization of these goals, however, is constrained by a

number of factors including the environment in which extension activities are carried out such as the level of farmers' education and literacy; the policy framework in agricultural development and the capacity of the extension system to deliver effectively (Feder *et al*, 1999). Van den Ban and Hawkins (1996) defend that; countries use different meanings and terminology to describe related processes, depending on the field in which extension is focused. Mozambique uses the term Rural Extension making it clear that the GOM is concerned with rural development through Extension.

Mozambique embraced primarily the idea that RE refers to the information and teaching functions of technology transfer in which RE is believed to provide the communication link between politicians, policymakers, researchers and the users of agricultural technology (The World Bank, 1985). This idea led to the optional specialisation of extension workers in a specific subject instead of the respecting generalisation (MAP, 1997). The specialisation of extension workers is believed will improve extension workers' knowledge in a specific discipline or sub-discipline and effectively transfer it to farmers (de Beer, 2000). However, according to de Beer, specialists are experts in a special branch of work or field of study. They need technology updates in a regular basis. Additionally, there is insufficient capacity for the specialist to accept responsibilities in agricultural development while keeping up with developments in the field, as it results in one or both tasks being neglected (de Beer, 2000). This analysis challenges the option to subject matter specialists in Mozambique.

4.4.2 Sustainable agricultural development – the paradox

The mass of literature on sustainable development does not provide the developments, approaches and frameworks on sustainable systems (Rigby *et al*, 2000). The reason is that different people do not share the same understanding on issues that refer to what must be sustained, for whom and for how long, for whose benefit, at whose cost, over what area and measured by what criteria (Manpholo & Botha, 2004). Manpholo and Botha (2004) further suggest that the different interpretations of this concept may be the cause for poor results in various development programmes related to NRM. For instance, the replacement of the term sustainable on development programmes by terms such as 'improved practices/systems/management' and 'reasonable development' would facilitate the design of appropriate indicators to measure development programmes

Sustainability as development is guided by the principle that the needs of the present generation must be met without compromising the ability of future generations to meet their own needs (Manpholo & Botha, 2004). The lack of clarity on the practical meaning of sustainability and how it can be measured, in many instances calls for the integration of the term sustainability with concepts such as with farming practices or livelihood systems.

The Low External Input for Sustainable Agriculture (LEISA) is based on the concept of conservation agriculture, which is part of Integrated Natural Resource Management (INRM). LEISA includes areas such as, soil and water conservation, agro forestry, agro ecological research, organic farming, terracing and irrigation (Haverkort & Zeeuw, 1991). LEISA provides options, which can be used to improve NRM. Sustainable development in agriculture is not only a matter of introducing new technologies or improving existing practices in NRM. Neither is it an isolated task of the agricultural sector. Rather, it implies a global shifting in the paradigm of farming through improvements in the communication function as a means to elevate farmers' educational standards that will accommodate changes (Manpholo & Botha, 2004). In practice, 'sustainable' is a paradoxical concept in the African agriculture. It better means to improve, at the possible extent, the management of the natural resource base. Hagmann *et al* (2002), based on Zimbabwean and South African experiences on dynamic livelihoods systems, share the same view when argue that only change itself is sustainable.

4.5 The research procedure

To obtain a major representation of public sector extension workers, a survey research method was decided on consultation with the district directorates of agriculture in the five districts of the Cabo Delgado province that have public sector RE networks, namely Chiúre, Namuno, Montepuez, Balama and Mueda (finally not included due to logistical constraints). A semi-structured questionnaire was used. Initially, meetings with extension workers were carried out to explain about particulars of the survey. These meetings were also used to gather information such as to assist the study. All public sector extension workers in each district were given the opportunity to participate in the survey. Table 4.1 provides an overview of the number of respondents in each survey district. In all, 55

extension officers, representing 63.5% of the extension workers in the province were interviewed.

Table 4.1: An overview of the number of respondents in each survey district

| Districts | Respondents | | Total number of public sector extension workers in each district | % of respondents per district surveyed |
|--------------|-------------|----------|--|--|
| | Male | Female | | |
| Chiúre | 15 | 1 | 20 | 80 |
| Montepuez | 18 | 0 | 20 | 90 |
| Balama | 6 | 0 | 10 | 60 |
| Namuno | 15 | 0 | 15 | 100 |
| Total | 54 | 1 | 65 | 84.6 |

After that extension workers were asked to complete the questionnaire used to collect data. The study was conducted in December 2004 and January 2005. Additional information was accessed through a literature survey that included provincial and district reports in the agricultural directorates, information provided through key informants including NGOs operating on the districts surveyed, and follow-up questions with extension workers. The empirical data analysis of this paper was carried out by the statistical component of Microsoft Excel. Because there were an insignificant number of female public sector extension workers in the entire province, data will be analysed without differentiating gender.

4.6 Findings and discussion

The findings consist of a description of extension workers demographics, the major constraints to RE work among farmers' communities and a discussion on each of the constraints.

4.6.1 Demographics of respondents

The average age of extension workers is 36.5 years; the youngest extension worker is 27 years old and the oldest is 45. More than 43% are aged between 36 to 40 years old, about 33% between 31 and 35, 14.5% between 41 and 45; and 7.2% are aged between 27 and 30 years old. The length of experience of the most experienced extension worker is 25 years and the shortest is 2 years. On average respondents have worked for 10.8 years as extension workers,

and more than 70% of the extension workers have served for more than 10 years. All extension workers have attended pre-service training, which varies in length from 1 to 4 months. All public sector extension workers are living in their working villages. Some of them serve in two or three villages at the same time, depending on the nearness of those villages. The constraints affecting the ability of RE to improve NRM are presented in the section 4.6.2.

4.6.2 Constraints to the Rural Extension ability to improve natural resource management

The following constraints were perceived by respondents, and the number of times cited in the questionnaire is shown in Table 4.2. The constraints were selected from an array of eleven constraints that were most often cited by extension workers. Similar constraints were consolidated resulting in the six constraints listed in the Table 4.2. For example, “low salaries” and “work under contract of extension workers” were cited by the respondents, but were consolidated into ‘lack of incentives and no motivation’ as these are specific problems which affect the ability of RE in improving NRM.

Table 4.2: Constraints affecting RE ability to improve NRM

| Type of constraint | Number of times cited | % of respondents |
|--|------------------------------|-------------------------|
| Limited availability of logistics | 55 | 100 |
| Lack of coordination among extension providers | 52 | 96 |
| Weak research-extension linkage | 51 | 92.7 |
| Lack of incentives and motivation | 46 | 83.6 |
| Little or inappropriate in-service training | 17 | 30.9 |
| No focus on NRM issues | 13 | 23.6 |

4.6.2.1 Limited availability of logistics

The limited availability of logistics was indicated by the question that attempted to find out what the main extension constraints were. Issues most often cited were unavailability of fieldwork kits (94.5%); inadequate transportation (90.9%); and unavailable or late provision of inputs for field demonstrations (87%). With regard to transportation, extension workers explained that there was no maintenance provided for the bicycles and motorcycles they use. Also, there was no provision made in case of accident, theft or damage. The survey highlighted the fact that the number of planned demonstrations is

reduced every year due to the unavailable or late provision of inputs. Extension workers listed a cause of reducing their capacity to provide field services as the lack of fieldwork equipment. These constraints, in the view of extension workers directly interviewed, are reducing the status of extension workers in the opinion of farmers.

4.6.2.2 Lack of coordination among extension providers

Some 96% of the respondents responded in the negative to the question about joint planning, implementation and evaluation of RE activities among extension providers. However, 32% of respondents mentioned that there have been information sharing and (infrequent) meetings among extension providers. The survey indicated that this lack of coordination is extended to other exploiters of natural resources such as timber companies. The mass of respondents (98%) considers the relationship with these companies as weak. According to these respondents, this weakness is caused by the fact that these companies 'have all they need to develop their activities', meaning that they can do without extension services. It was further reported by one of the NGOs existing in Cabo Delgado province that they found it difficult to coordinate activities with the public sector RE because of the inflexibility of these services to update their annual planning, which is centralized and conceived at the national level. The 'top-down' approach to public sector RE seems to be one of the leading problems faced by RE services, as it does not allow the necessary flexibility for these services to coordinate programmes with other extension providers.

4.6.2.3 Weak research-extension linkage

There was a common perception among extension workers (100%) that the linkage of research to extension is 'very important' to improve NRM. They believed that it would alert researchers to the real problems that farmers have, which in turn would facilitate the recommendation of appropriate technologies. However, 51 (92.7%) of respondents considered the research-extension linkage to be weak. On the reason why the research-extension linkage is weak, 41 (74.5%) respondents thought it was because there are no research institutes in Cabo Delgado province; 52 (94.5%) consider that there is a lack of organizational initiatives by agricultural authorities; and 3 (5%) lay blame on investigators 'who are not willing to cooperate'.

4.6.2.4 Lack of incentives and motivation

The survey revealed that even though extension workers are not willing to comment about whether their salaries are adequate or not, they think the system of remuneration must be reviewed. The survey results also showed that the respondents' salary levels are determined by preset values for medium, basic and elementary level technicians. This does not make allowance for other factors, such as the number of service years as this usual by the case in the Mozambican system of remuneration. This is explained by the 'work in contract' status of extension workers. This 'work in contract' status was mentioned by almost 90% of respondents as the main cause of existing lack of motivation. The survey revealed that extension workers are apprehensive about the situation, as, despite many years of working for the State, they still are working as annual contract employees and remain not integrated as civil servants as yet. Respondents also feel undervalued by the better working conditions offered by other extension providers such as NGOs or the private sector to their technicians.

4.6.2.5 Little or Inappropriate in-service training

The survey revealed that in-service training is uncommon, or is inadequate to extension workers and farmers' requests and consequently do not take action in line with farmers' needs. However, 63.6% of respondents were said to have attended in-service training that dealt with NRM issues. Curiously, these respondents have 10 or more years experience in extension work while the remaining 30.9%, who said they have not attended such training courses, and 5.5% who did not answer the question, have less than 9 years of experience in extension work. This difference could be explained by budgetary restrictions to the DNER, which see these services reducing the number of activities including appropriate in-service training. Another interesting finding was that all extension workers consider themselves to be Subject Matter Specialists, meaning that they have a specific area of specialisation. However, it was confusing that each respondent indicated more than one area of specialisation. The most cited areas of specialisation are rural extension (89%), soil and water conservation (70.9%), crop production (41.8%), livestock (18%), pest management (14.5%), and land tenure and conflict management (11%).

4.6.2.6 Limited focus in natural resource management issues

The limited focus on NRM issues was listed by only 13% of respondents as a problem. Although this matter did not receive much prominence, it is discussed because it covers the theme of the study. The survey showed that the annual planning of extension activities in the province does not include the facilitation of seeking solutions for the farmers' existing problems in NRM, such as soil degradation, deforestation and human-animal conflict. Instead, it is based on the demonstration method using expensive inputs such as improved seeds, herbicides, fertilisers and pesticides that farmers cannot afford to buy.

4.7 Conclusions and recommendations

The paper analysed factors that affect the extension role on improving NRM in Cabo Delgado province in the north of Mozambique. Although it is an empirical analysis, it is assumed that it provides useful information for the support of policymakers in rethinking NRM in Mozambique particularly and in other developing countries in general.

The results of the study reveal that the existing constraints affecting the ability of RE to improve NRM can be overcome if the following processes are considered:

- Coordination and collaboration promoted by fostering strong partnerships and networking among different RE providers.
- Clarified policies in the extent to which NRM issues should be addressed by RE providers
- Facilitated the establishment of local supporting tools, such as community development councils, to decentralize planning of RE activities.

In parallel to the existing deficient policy framework which undermines the mission of RE to improve NRM, it seems there is a gap in the system of extension itself. It results in structural problems inside the RE service, such as the weakness of the research-extension linkage. The extension system should consider developing its own research on a small-scale basis to deal with the real problems that farmers experience (e.g. farmer-led research). This locally developed research, in its turn, should get technical advice from

research institutes. This methodology would redirect extension into being more reactive to farmers' problems and consequently recover the credibility of extension among farmers.

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Annexe 5

Questionnaire

(Extension Workers)

This questionnaire relates to all extension workers in Cabo Delgado Province either from public sector (State) or non-governmental organizations (NGOs) agricultural extension. Extension workers refer to both male and female individuals living in the village and serving agricultural extension services. The information provided here is strictly confidential and will be used for research purposes only. It is kindly requested your collaboration.

Instructions

Mark with (X) in the box in front of your appropriate response and write an appropriate answer on the provided space. You can mark more than one box if is the case.

Geographic position in the Province 1. North 2. Centre 3. South

District -----

Ward No -----

Section 1: Personal Information

Name: -----(Optional)

Sex 1. Male 2. Female

Age: -----

Section 2: Pre Service and In-service Training Assessment

2.1 How did you join agricultural extension services?

1. Voluntary application 2. Post school appointment 3. Recruitment

2.2 How many years are you working with agricultural extension services? -----

2.3 Did you attend pre service training before starting field activities? 1. Yes 2. No

If yes, what was this pre service training duration? ----- months

2.4 Where the teaching staff was from?

1. Ministry of Agriculture (national level)
2. Provincial Directorate of Agriculture
3. Other Ministries (e.g. Education) (explain) -----

4. International Agencies (e.g. NGOs) (explain) -----

2.5 Did pre service training address natural resource management? 1 Yes 2. No

If yes, what issues were considered?

1. Soil conservation 2. Water conservation 3. Forests and wildlife
4. Land tenure and conflict management 5. Parks and Reserves management
6. Pest management 7. Production systems 8. Conservation agriculture
9. Others (please list) -----

2.6 Has there been any in-service training course in natural resource management offered to you during the last two years? 1. Yes 2. No

2.7 Are you a subject-matter specialist? 1, Yes 2. No

If yes, what is the area of your specialization?

1. Livestock 2. Crop Production 3. Pest Management
4. Land Tenure and Conflict Management 5. Soil and Water Conservation
6. Forestry and Wildlife 7. Rural Extension
8. Other (explain) -----

2.8 How would you describe the main purposes of your job? -----

2.9 How do you judge the relevance of extension workers being trained in natural resource management?

1. Unimportant 2. Little important 3. Moderately important
4. Important 5. Very important

Explain why -----

Section 3: Extension Workers Performance Assessment

3.1 How many farmers do you visit per month? -----

3.2 How many farmers do you visit more than once in the same month? -----

3.3 How often do you visit groups of farmers (as opposed of individuals)? -----

3.4 How many demonstrations/on-farm trials do you organize per year with farmers?

None 1 - 5 6 - 10 11 – 15 16 – 20 more than 20

3.5 What are these demonstrations about? (Please underline the examples in accordance with your demonstration matters)

1. Crop production (e.g. use of herbicides, test of new varieties, growing techniques)
2. Farming systems (e.g., conservation tillage, consociation of crops, agroforestry)
3. Pest management (e.g. use of pesticides, use of local techniques)
4. Soil conservation (e.g. zero-tillage, terraces to reduce runoff erodibility, use of Vetiver grass barriers and cover crops to protect surfaces against raindrop erosion)
5. Water conservation (e.g. tide ridges, slope ditches, water holding structures)
6. Grain Storage (e.g. traditional improved grain storage, traditional pesticides)
7. Others -----

3.6 How many field days do you organize per year? -----

3.7 How many supervisory visits from agricultural extension officers do you hold in the field per month? -----

3.8 How do you engage with researchers?

1. Meetings/workshops (how often) -----
2. In the field (how often) -----
3. Other (explain) -----

3.9 How relevant is the research to your work?

1. Unimportant
2. Little important
3. Moderately important
4. Important
5. Very important

Explain why -----

3.10 How relevant is the research to natural resource management?

1. Unimportant 2. Little important 3. Moderately important
 4. Important 5. Very important

Explain why -----

3.11 What 'input' do you have to the research agenda? -----

3.12 How do you solve the problems encountered during your practical work?

1. Investigate your own solutions
 2. Discuss with your colleagues
 3. Report and discuss with your supervisors
 4. Discuss with farmers
 5. Other -----

3.13 The research-extension link is probably weaken because:

1. There is no strong research institutes at provincial level
 2. Researchers are not willing to work on the field
 3. There are no organizational initiatives to put research and extension together
 4. Researchers do not cooperate

Other possible reasons -----

3.14 What kind of transport do you use in your fieldwork?

1. Move on foot 2. Bicycle 3. Motorcycle 4. 4-wheel vehicle

3.15 Is the transport you use adequate for your activities? 1. Yes 2.

Please explain -----

Section 4: Agricultural Extension Links

4.1 How do you cooperate and connect with extension workers from other organizations (i.e. public sector extension/ NGOs/ private sector extension)?

1. Shared information (how often) -----
2. Joint planning, implementation and evaluation of field activities (how often) -----
3. Through shared resources and means (e.g. transport) (how often) -----
4. Through joint problem solving (how often) -----
5. Regular meetings (how often) -----
5. Other (explain) -----

4.2 With what organization extension have links?

1. Private sector (e.g. input supply traders, commercialisation bodies)
2. NGOs (e.g. Helvetas, AGA KHAN, AAA)
3. Timber companies
4. Farmers organizations (associations, cooperatives)
5. Others (list) -----

4.3 For the responses in 4.2, describe the strength of these links (1.very strong / 2. strong / 3. weak / 4. very weak)?

1. ----- Why-----
2. ----- Why-----
3. ----- Why-----
4. ----- Why-----
5. ----- Why-----

Section 5: Practices In Natural Resource Management

5.1 Based on your broad knowledge of existing farming systems in Cabo Delgado, rate which of the following systems you consider as either good or bad practices according to the agricultural extension principles that you use? (Please fill the box in front of the described practices with G if good and B if bad).

1. Shift cultivation
2. Conservation agriculture (No-till, green-manure, crop rotation and multicropping)
3. Burning practice as a clean tillage method (substituting hoe ploughing)
4. Use of agrochemicals (i.e. herbicides and pesticides)
5. Conversion of native vegetation to crop production and to pasture
6. Fuelwood sold to increase farmer's income
7. Intensive burning for animal hunting purposes
8. Combining trees (e.g. leguminous species) with food crops (e.g. maize, beans)
9. Reforestation
10. Afforestation (conversion of land in artificial forests)
11. Fishing using poisonous traps (e.g. native vegetation species, pesticides)
12. Others -----

5.2 From the practices in the 5.1 (above), please list those introduced by rural extension services in Cabo Delgado? -----

5.3 Do farmers collaborate and adopt extension recommendation messages about improved practices in natural resource management? 1. Yes 2. No

If yes, why do you think they collaborate:

1. Because they listen carefully to you
2. Because they participate actively and ask questions
3. Because they implement what they have heard and discussed
4. Others (explain) -----

If no, what reasons do they give -----

5.4 Suggest three (good) natural resource management practices that you feel are suitable to Cabo Delgado and could be incorporated into the agricultural extension programme ?

(1st practice) -----

Reasons for choosing: 1. You have the knowledge and skills to deliver

2. You have information 3. You have the support and the authorisation

3. Resources are available 4. Conditions are favourable

5. People are ought to participate 6. Others -----

(2nd practice) -----

Reasons for choosing: 1. You have the knowledge and skills to deliver

2. You have information 3. You have the support and the authorisation

3. Resources are available 4. Conditions are favourable

5. People are ought to participate 6. Others -----

(3rd practice) -----

Reasons for choosing: 1. You have the knowledge and skills to deliver

2. You have information 3. You have the support and the authorisation

3. Resources are available 4. Conditions are favourable

5. People are ought to participate 6. Others -----

Section 6: Extension Worker Constraints

6.1 What are (for you) the major constraints rural extension faces that prevent you from successfully performing the extension worker role? (Please list 3 and explain each one)

1. -----

2. -----

3. -----

Section 7: Additional Comments

7.1 Please make any additional comments or suggestions that you feel are important about what could be done by rural extension to improve natural resource management. Please feel free to include issues that have not been covered in the questionnaire -----

Thank you very much for your collaboration

CHAPTER FIVE

GENERAL CONCLUSIONS AND RECOMENDATIONS

This thesis synthesizes the results of a study investigating the relationship between RE services and NRM in Mozambique with particular reference to Cabo Delgado province. Semi-structured questionnaires were used to survey extension workers and farmers to obtain their views and perceptions about the relationship between RE and NRM. The thesis has been organized into five chapters. This chapter starts summarising the issues addressed on each chapter ending up with the main findings and recommendations withdrawn from each chapter.

Chapter One gave the setting in Mozambique, underlining existing natural resources and their importance to Mozambique's economy in general and to the rural communities in particular.

Chapter Two examined RE services in Mozambique and in particular Cabo Delgado province. The focus was given to the provision of RE services in Mozambique especially after its institutionalisation in 1987, emphasizing the application of PROAGRI. The chapter also comparatively examined the structure and approaches of RE between the public sector and other extension providers mainly NGOs and the private sector.

Chapter Three investigated issues pertaining to the relationship between RE and NRM in Mozambique and particularly in Cabo Delgado province. The chapter, which discusses survey findings, presented farmers' perceptions on issues related to existing farming practices and their relationship to RE. Farming characteristics, training and farmers organizations were selected and discussed as important issues pertaining to the RE and NRM relationship.

Chapter Four identified and discussed RE constraints affecting the relationship between RE and NRM in Cabo Delgado province. Extension workers identified the major constraints affecting their fieldwork.

5.1 General conclusions

The study results showed that RE services do not adequately support NRM; therefore the RE/NRM relationship is weak. The study further revealed the following factors as the cause affecting the ability of RE to address effectively NRM among farmer communities:

- Inadequate RE approach and its inflexible ‘top-down’ nature mainly within public sector RE. This approach is not responsive to farmers’ problems therefore opening a relational gap between extension workers and farmers. Moreover, farmers become disinterested in the RE work, thereby undermining extension workers’ credibility among communities they assist.
- Public sector human and financial resource limitations. These constitutes the main constraint to the RE fieldwork as it makes it very difficult for public RE services to translate into implementation the GOM agricultural policy objectives. Specifically, these limitations prevent public sector RE from executing effectively MINAG’s preferred extension methodology (i.e. the T&V system), which is highly dependent on resources being available.
- Lack of coordination among RE providers in Cabo Delgado province. This issue manifests itself in duplication of effort and conflict in agendas. This leads to inefficient use of the scarce available financial and human resources. As a result, resources are often wasted and development opportunities are lost.
- There is no clarity on the extent to which NRM issues should be addressed. Despite the reasonable policy environment created by the GOM to improve NRM, RE lacks supporting implementation mechanisms at the field level to translate the GOM agricultural policy objectives into action.
- The National System of RE in Mozambique is no longer accommodating the socio-political changes that have taken place after the civil war. As a result, RE does not find an appropriate space in which to execute its programmes.

5.2 General recommendations

The establishment of a strong relationship between RE and NRM needs, as its foundation, an active involvement of all stakeholders in agricultural development. However, policymakers, extension services and farmer communities share the major responsibility. According to the conclusions presented in the section 5.1, the following recommendations are made:

- A shift from the inflexible 'top-down' to locally tailored participatory approaches. These approaches should be developed so that innovation of new management systems can occur and be adapted to the resource-poor farming conditions typical of rural areas in developing countries.
- Farmers' participation in the agricultural programme should be fostered in four ways:
 - (i) Through the dissemination of technologies that are affordable to farmers and that are appropriate to their needs.
 - (ii) Through farmers' empowerment through training, education and other learning opportunities;
 - (iii) Through a more wide-spread promotion and facilitation of effective farmer groups such as farmers associations, cooperatives, and study groups;
 - (iv) Special attention should be given to recognizing and incorporating local knowledge as a valuable input to technology development.
- Strong stakeholder partnerships between and among the public, private and NGO RE providers should be formed. This would allow the design of a unique national agenda for RE services in Mozambique which should include:
 - (i) A shared vision for the outcomes of RE;
 - (ii) A coordinated allocation and mobilisation of human and financial resources (to gain synergy as well as to eliminate duplication of expenditure);
 - (iii) An overall RE workplan/programme; and
 - (iv) Coordinated management, monitoring and evaluation of agricultural programmes.

- RE services must shift to facilitated/learning-based extension to accommodate, among other things, new ideas and opportunities resulting from the realizing the desired strong relationship between RE and NRM.

From these discussions ~~it becomes evident that~~ the National Directorate for Rural Extension will need to foster collaboration between public and private sector extension services so that more resources are available for the implementation of the RE programme. It will also need to ensure that farmers are fully engaged in every aspect of the RE programme. When these two elements are achieved, the main stakeholders will be in a learning partnership that can greatly improve the livelihoods particularly of resource-poor farmers in Mozambique.