TRADITIONAL AGRICULTURE AND ITS MEANING IN THE LIVES OF A FARMING COMMUNITY: THE CASE OF EMBO

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ABSTRACT

For the majority of rural people, agricultural activities continue to be one of their main livelihood strategies. Production of food crops is not dependent on any formally acquired knowledge of farming but is solely based on indigenous agricultural knowledge passed from generation to generation through experience and careful observations. Resource-poor farmers, especially in rural areas, follow traditional farming methods to produce their food crops and these are specifically tailored to suit their environments.

Embo is located in rural KwaZulu-Natal and falls under Mkhambathini municipality. The area is characterised by small-holder farmers who are mainly Ezemvelo Farmers Organisation (EFO) members. The purpose of this study was to review the farming practices followed by farmers in respect of food crop production and secondly to understand what influences the continual practice of such farming practices among rural farming communities of Embo in KwaZulu-Natal especially the EFO farmers. The study looked at what farmers see as traditional agriculture. A combination of qualitative and quantitative methods was used for the study. Data collection methods included participatory observations, semi structured face-to-face interviews and focus group discussions.

The study found that farmers are happy to follow traditional farming methods to produce their food crops. Traditional farming tools such as the hoe and animal traction are the main implements used to prepare land. Household members are the main source of farm labour with men mainly responsible for ploughing activities while the bulk of planting, weeding and harvesting activities is the responsibility of women. Cropping patterns include intercropping and crop rotation with common crops being amadumbe, beans, maize and sweet potatoes. The majority of these crops are produced for both subsistence and commercial reasons. Amadumbe is an important commercial crop produced organically.

Crop protection against pests is done through traditional methods where farmers mix some concoctions made from locally available resource in order to minimise losses. Kraal manure is the main soil fertility strategy followed by farmers. Landrace seeds

are the main seed type used by the farmers. Local seed sources include own production and asking from other farmers. Crops with good qualities are selected in fields and maintained as seeds, which are then stored separate from those for home consumption. Harvesting is mainly done manually and for important crops such as tubers with short shelf lives, harvested through piecemeal methods.

Farmers are able to generate some income from their efforts and this contributes to local economies and household food security. Farmers value their farming methods and see their farming as efficient despite challenges. There is a need to consider developing labour support groups in order to ease the burden of labour especially by women. In view of the importance of traditional farming in the lives of rural people, it is important that agricultural scientists and extension officers take into consideration the knowledge farmers already have so as to develop technologies suitable for farmers' environments.

DECLARATION

I, **KETSHOGILE PAULINE MARAGELO**..... declare that:

(i) The research reported in this thesis, except where otherwise indicated, is my original research.

(ii) This thesis has not been submitted for any degree or examination at any other university.

(iii) This thesis does not contain other persons' data, pictures, graphs or other information, unless specifically acknowledged as being sourced from those persons.

(iv) This thesis does not contain other author's writing, unless specifically acknowledged as being sourced from other authors. Where other written sources have been quoted, then:

a) their words have been re-written but the general information attributed to them has been referenced;

b) where their exact words have been used, their writing has been placed inside quotation marks, and referenced.

(v) This thesis does not contain text, graphics or tables copied and pasted from the Internet, unless specifically acknowledged, and the source being detailed in the thesis and in the References sections.

Signed: …… Date ……

DEDICATION

This thesis is dedicated to my late father, Ramonyenyane Juluis Maragelo, for he always believed in my potential.

My two late sisters, Granny and Nene, you were my best friends. I wish you lived to see my success.

The rest of my family for being patient while I studied.

To my supervisor Prof JM Green, she saw the potential in me and made me what I am today.

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ABBREVIATIONS AND ACRONYMS

EFO:	**Ezemvelo Farmers' Organisation**
FAO:	**Food and Agriculture Organisation of the United States**
IFAD:	**International Fund for Agricultural Development**
SANPAD:	**South Africa-Netherlands Research Programme on Alternatives in Development**

CHAPTER ONE: THE PROBLEM AND ITS SETTING

1.0 Importance of the study

For the majority of rural people, agricultural activities continue to be one of their main livelihood strategies. Production of food crops is not dependent on any formal knowledge of farming but is solely based on indigenous agricultural knowledge passed from generation to generation through experience and careful observations (Fawole and Oladele, 2007; Kuye *et al* 2006). Continual dependence on indigenous knowledge has resulted in a farming system relevant for conditions of these farmers, thus guiding farmers to use available natural resources to secure livelihoods. In this context, this farming system is assumed to be based on application of organic fertilisers such as kraal manure, using traditional implements such as the hand hoe for soil cultivation and weeding, relying on indigenous innovations for crop protection and largely using household labour to carry out farming activities (Mapfumo *et al*, 2005; Graves *et al*, 2004, Maruo 2002; Loomis, 1984)

Most agricultural activities are around the homestead or in home gardens, characterised by small plots of not more than 2 hectares of cultivated land (Chimbidzani, 2006; Pound and Jonfa, 2005). Land use practices range from shifting cultivation to permanent cultivation where mixtures of crops are planted every year on the same fields and practiced by millions of farming communities in rural areas.

Throughout the world in rural communities, water is the major constraining factor since the majority of agricultural production is rain-fed (Kaihura and Stocking 2003; Modi, 2003). To overcome this constraint, farmers have devised cropping systems that involve the cropping of different crops on the same piece of land. This cropping pattern is referred to as intercropping and it is widely practiced in Africa, Asia and Latin America, and is considered as a means of increasing crop production per unit land area with limited resources especially with low external inputs and minimal risk of total crop failure (Vandermeer, 1989). On the other hand farmers are faced with challenges of maintaining soil fertility within their farming systems; to overcome this challenge, farmers throughout the developing and poor countries rotate crops on that very same piece of land to enhance soil fertility and prevent some crop diseases. Crop rotation is a traditional strategy of plant protection against diseases, which involves

growing crops of different types on a recurring sequence on the same piece of land (Norton *et a*l, 1995).

To support this practice farmers have also devised some indigenous pesticides derived from natural resources such as plants that carry pesticidal properties like a neem tree to protect their crops against diseases. Some of these technologies have been in existence ever since people started to cultivate crops and are still in practice today. They are thought to be better when compared to chemical pesticides (Abate *et al*, 2000; Corbeels *et al*, 2000).

All the farming practices that are followed by farmers especially in remote rural areas are believed to be traditional due to the fact that have been practiced over a long period of time and farmers are knowledgeable about these practices (Kuye *et al,* 2006). Commonly grown food crops under traditional agricultural practices especially in South Africa include legumes such as beans, cowpeas and ground nuts; cereals such as maize, sorghum and ground tubers such as sweet potatoes, *amadumbe* and potatoes, and a range of leafy vegetables which include pumpkins leaves and some indigenous vegetables (Silwana *et al*, 2007; Mkhabela, 2006).

Production of these crops employing traditional farming methods such as the application of manure has enabled the majority of resource poor farmers to feed their households and in cases when harvest is good and there are surpluses, the latter are sold to generate some income used acquire commodities that are not produced at farm level (Lungu, 1999; Kirsten and van Zyl, 1998). However opponents of traditional agriculture still maintain that it is backward, unproductive and non-commercial and cannot meet the needs of the poor (Kirsten and van Zyl, 1998). This view has however not stopped rural farming communities from producing their food crops based on traditional methods even though they may have information about modern farming methods (Iyegha, 2000).

Given the widespread dependency of rural farming communities on traditional farming methods throughout the developing and underdeveloped countries, it is important for the purposes of this study to investigate the practice of these methods with regard to food production [crops] in the context of rural farming communities in

South Africa, Embo community presents a good opportunity to such research. As a result, this study was initiated to document information about farming practices in a rural context, what influences such practices and recommend how these farming practices followed by EFO farmers can be recognised as a production system for the majority of rural communities throughout the country.

Therefore, the purpose of investigating the existence of traditional farming methods and the understanding of what farmers already know is to document these farming methods so as to facilitate the influence of scientists who seek to enhance production systems in rural communities.

1.2 Statement of the research problem

In South Africa many rural farmers rely on available natural resources and indigenous knowledge to produce food crops. The majority of these farmers maintain a subsistence orientation and rely heavily on family labour to carry out farming activities with a large proportion of the production used mainly for home consumption. While holding this view, generations and generations of farming communities were able to pass on this farming knowledge and the knowledge is still held by many even today. The majority of these farmers do not have any formal education in farming but successfully produce food crops and sustain their livelihoods.

Embo is one of the rural communities in KwaZulu-Natal which produce food crops around their homesteads and agriculture in this area is mainly rain-fed. As a result traditional farming is still prevalent as a farming system in this community. Therefore this study was conducted to shed light as to what is considered traditional farming methods in the eyes of farmers, how farming knowledge is passed from generation to generation and what influences this practice.

There are limited studies done in relation to the existence or rather the practice of traditional agriculture in the context of rural South Africa. The purpose of this study is therefore two-fold. Firstly to review the farming practices followed by farmers in respect of food crop production and secondly to understand what influences the

continual practice of such farming practices among rural farming communities of Embo in KwaZulu-Natal.

1.2.1 Research Sub Problems

Three sub-problems were developed for this study in an attempt to achieve the purpose of this study.

Sub problems 1

What is understood as traditional agriculture? How is knowledge about this practice acquired and transferred to household members?

- Which methods are followed to prepare land?
- Which farming implements are used?
- What are the common cropping patterns followed by farmers?
- Which methods are followed to ensure soil fertility?
- Which methods are followed to protect plants?
- What are the methods used to acquire seeds?
- How is harvesting carried out?

Sub Problem 2

What influences farming practices that are followed?

- What are the reasons for practising these methods according to the farmer?
- Which crops are mainly produced?
- What are the reasons for producing these crops?
- How are labour decisions made?
- How is this farming practice valued?

Sub-problem3

What are the differences between traditional, modern and mixed farming classifications?

- Are there differences in cropping patterns?
- Are there specific crops grown in any of the farming classifications
- What are the differences in soil fertility management strategies.

1.3 Conceptual frame work

This study is based on the premise that rural farming communities still practice traditional farming methods and that there are factors that influence this practice. The study takes into recognition that farming as a system has inputs, throughputs and outputs. Such a system directs what resources are required and how in turn these resources interact to produce a farming system that can be considered for sustainable production.

The conceptual frame work of the study will be used as a guide to the literature review and it is presented in Figure 1.1

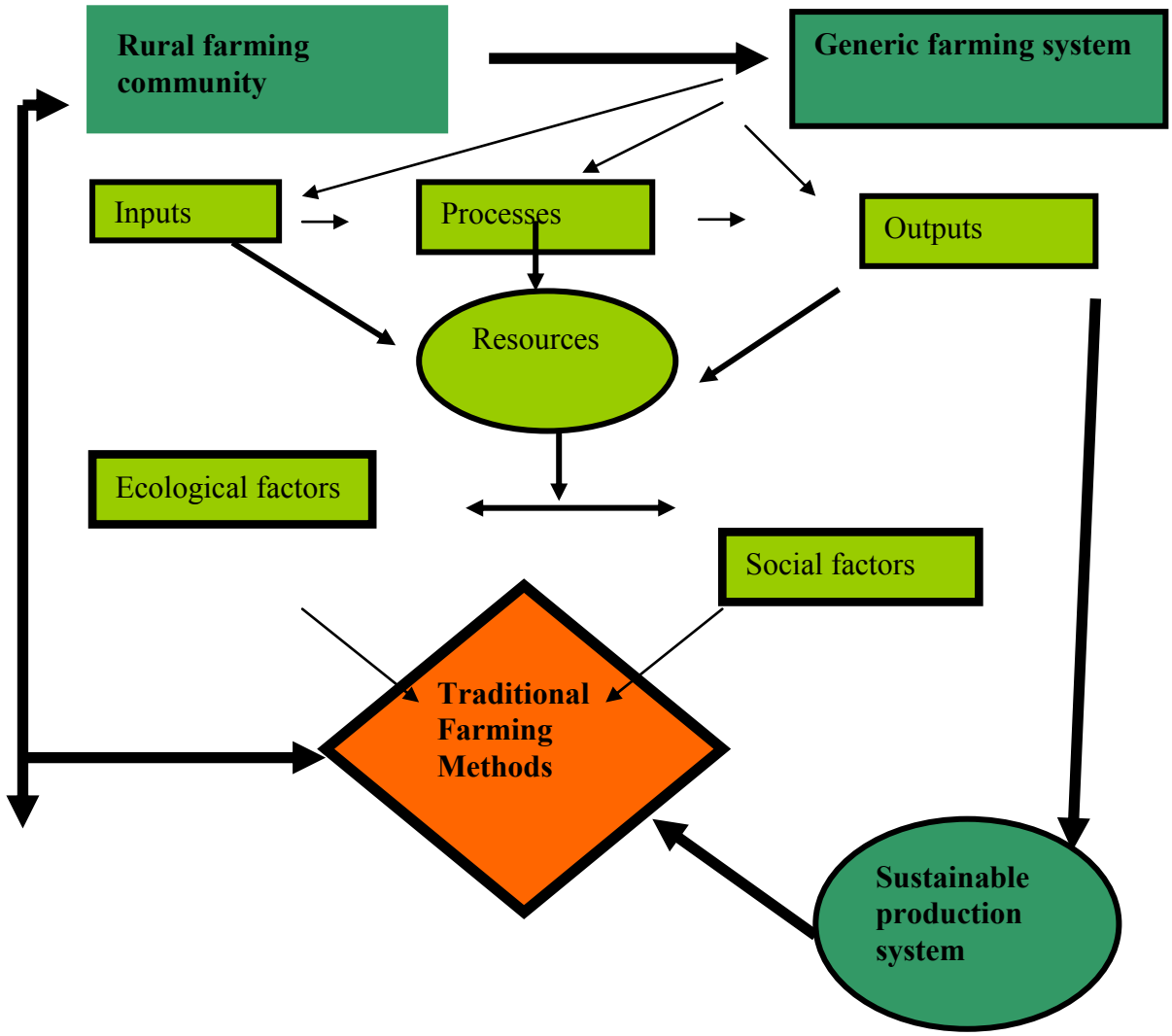

Figure 1:1 Conceptual frame work of the study

For farming systems to function properly, there is a need for inputs, processes and outputs and different resources are required. On the other hand, this study takes into recognition how social factors contribute in sustaining this production system which include labour distributions, decisions on land preparation, cropping patterns, farming implements, soil fertility, soil moisture, plant protection, seed acquisition and seed types, harvest and post-harvest processes. The balance between the understanding of ecological and social factors lead to a sustainable farming system. These practices have been in existence from time immemorial thus farmers are more familiar with them and extensively rely on them to produce their food crops. However, the concern is that production is low due to depleted and poor soils, poor soil fertility management, poor plant protection practices, and soil water conservation practices. Unfortunately in most cases, these assumptions are made without recognising what farmers are doing in respect of these challenges and how farmers manage to pass on this information from generation to generation in order to sustain their production systems. A search for a solution might be better served by building on a foundation of what farmers already know and what they have been practicing from time immemorial.

1.4. Study limits

There were a number of limits to this study:

- Only the farming methods practiced in Embo around homesteads were investigated but not other methods practiced elsewhere in the province or the country.
- The study was mainly confined to Ezemvelo Farmers Organisation (EFO) farmers producing food crops around their homesteads (with a few farmers who are not EFO members).
- The study investigated traditional farming methods in detail but not other large commercial methods or community garden farming practiced by EFO farmers or any other farmers in the area.
- The study relied on information provided by farmers themselves and not any other sources.

- The study observed only those methods practiced during the observation period but considered any other methods as informed by farmers.
- The study was not engaged in experimenting with the methods but only relied on information as provided by farmers
- The study did not measure the effectiveness of the methods but also relied on information as provided by farmers
- The study cannot be seen as representative of KwaZulu-Natal or even all farmers in Embo because of the in-depth study of few farmers.
- The study did not seek to understand whether farmers are following farming methods they follow by choice or need.
- The study did not document any other farming methods learned by farmers from elsewhere but only those methods that were learned from their parents through observations and experience.

1.5. Definition of concepts

For the purpose of this study, the following concepts applied**:-**

- Rural farming communities refer to people who reside in rural areas and produce their food crops around their homesteads or in home gardens, producing from a small piece of land mainly for home consumption.
- Traditional agriculture in this study refer to those methods that are followed by farmers and perceived as traditional by the farmers
- Traditional farming implements in this study refer to implements used by farmers to cultivate their land and have been in use from a long period of time.
- Food crops refer to those crops that are primarily grown for food though some farmers may sell some or all of the crops for cash.
- Certified organic farmers refer to farmer who produce their crops in accordance with specific regulations and has been inspected and approved certifying agent
- Shifting cultivation refers to a cultivation system where a piece of land is cleared for growing crops for a particular period then abandoned for another piece.

- *Amadumbe* in this study refers to starchy tubers also called taro or *Colocasia Esculata* produced by the EFO farmers through organic farming.
- Landraces refer to seed types produced by farmers over along period of time following traditional seed selection and production systems.

1.6. Methodology

1.6.1 Population

The primary population of the study was EFO members who produce food from areas around their homesteads. Traditional farming methods were observed among these farmers' homesteads or home gardens.

1.6.2 Sampling

For the purpose of this study, a sample of 65 farmers from six sections in Embo where EFO farmers are found was selected. On average, ten farmers from each of the six sections were purposively and conveniently selected. The sample was further divided into six focus groups from the same farmers being interviewed. Sample selection of farmers was based on the relationship the researcher built with them during observation period. For these reasons, the purposive sampling was deliberately chosen by the researcher based on particular characteristics of the group (Ritchie and Lewis, 2003).

1.6.3 Data collection

Data was collected in three phases. During the first phase data was collected through participative observation with 10 farmers during visits when building relationships. This data included general farming patterns that were informally observed and documented by the researcher and information as provided by farmers.

During the second phase data was collected through face–to-face interviews with all 65 farmers. This data included perceptions about traditional farming practices, implements used, labour responsibilities, crops and cropping patterns, soil and pest management, seed acquisition, harvest and post harvest management. Data in the third phase was collected from six focus groups; ten members from each group of farmers in the six sections of the study.

1.6.4 Instrumentation

Since the study is mainly qualitative, participatory learning and action (PLA) approach was used as the main tool for collecting data. Techniques used included participant observation, a discussion guide, field notes and a semi-structured questionnaire for farmers.

- A semi-structured interview guide was used to record data during face-to-face interviews. (See Appendix B1 & 2)
- A focus group discussion guide used to record data during six focus group discussions. (See Appendix 3)
- Field notes were used to record data during participatory observations with ten farmers. (See Appendix B 4)

1.6.5 Data analysis

Qualitative data were analysed using content analysis. The main aim of using content analysis was to extract from the transcript data that are informative and to extract the latent messages (Silverman, 2001). Quantitative data was analysed using statistical packages such as SPSS 13.0 version. This software was used to summarise the findings and to look for variations, correlations and relationships from different sample groups.

1.7. Study assumption

The main assumption of the study was that EFO farmers generally practice traditional farming methods even when they are certified organic farmers. The assumption is that if these methods are studied and understood, they will inform agricultural scientists and development agents who have interest in developing farming methods in rural areas.

It was also assumed that the practice of these methods is influenced by certain factors which sustain the methods. It is assumed that understanding these factors will shed light as to why farmers choose to farm in this manner.

It was also assumed that farmers are aware enough to identify traditional farming methods from modern farming methods. It was also assumed that recognising

farming methods of these farmers will help in building a framework to improve farming in rural areas so as to improve the livelihoods of the poor within the framework of the existing environments.

1.8. Dissemination of findings

This study contributes information to a technical report about the traditional farming methods which will be produced for the funders of the research (SANPAD) and for the EFO farmers. A dissertation is produced for examination for a Masters degree in Community Resources at the University of KwaZulu-Natal. The dissertation and the technical report will form a basis for a journal article, which will be prepared for publication in the African Journal of Food, Agriculture, Nutrition and Development (AJFAND). It is also envisaged that a poster or oral presentation will be made at an appropriate conference or workshop. It is anticipated that the study contributes to knowledge dissemination for the Departments of Agriculture, Arts and Culture, and Health who have a vested interest in traditional farming methods, the improvement of farming practices for increased production in rural areas and fighting poverty.

1.9. Organisation of the thesis

Chapter one has provided the background for this study. A review of literature relevant to this study will be presented in Chapter Two. Chapter Three presents a brief description of the area and the sample characteristics. A discussion of the methodology and analysis is presented in Chapter Four, while results and discussion of findings are presented in Chapter Five. Chapter Six presents conclusions and recommendations of the study.

CHAPTER TWO: LITERATURE REVIEW

2.0 Introduction

For the majority of rural people in under developed and developing countries, agriculture is not only the major source of food but a way of life where culture, traditions and values are embedded. Production of food crops is not dependent on any formal knowledge of farming but is based solely on indigenous agricultural knowledge passed from generation to generation through experience and careful observations (Fawole and Oladele, 2007; Kuye *et al* 2006; Jitsanguan 2001). Continual dependence on indigenous knowledge has resulted in a farming system relevant for the conditions of these farmers, thus guiding farmers to use available natural resources to secure livelihoods. In this context, this farming system was and is still largely practiced based on application of organic fertilisers such as kraal manure, using traditional implements such as the hand hoe for soil cultivation and weeding, relying on indigenous innovations for crop protection and largely using household labour to carry out farming activities (Mapfumo *et al*, 2005; Graves *et al*, 2004; Maruo 2002; Loomis, 1984)

Most agricultural activities are around the homestead or in home gardens, characterised by small plots of not more than 2 hectares of cultivated land (Pound and Chimbidzani, 2006; Jonfa, 2005). Land use practices range from shifting cultivation to permanent cultivation where mixture of crops are planted every year on same fields and practiced by the majority of farming communities in rural areas. Household members are a pool of labour for all farming activities with women carrying out the bulk of farming activities (Lu 2007).

Throughout the world in rural communities, water is the major constraining factor since the majority of agricultural production is mainly rain-fed (Kaihura and Stocking 2003; Modi, 2003). To overcome this constraint, farmers have devised cropping systems that involve the cropping of different crops on the same piece of land. This cropping pattern is referred to as intercropping and it is widely practiced in Africa, Asia and Latin America. It is considered as a means of increasing crop production per unit land area with limited resources especially external inputs and minimal risk of total crop failure (Vandermeer, 1989). On the other hand farmers are faced with

challenges of maintaining soil fertility within their farming systems. To overcome this challenge, farmers throughout the developing and poor countries rotate crops on that very same piece of land to enhance soil fertility and prevent some crop diseases. Crop rotation is a traditional preventive strategy of plant protection against diseases, which involves growing crops of different types in a recurring sequence on the same piece of land (Norton *et al,* 1995).

To support this practice farmers have also devised some indigenous concoctions derived from plant materials and locally available resources to protect their crops against diseases. Some of these technologies have been in existence ever since people have started to cultivate crops and are still in practice today. They are thought to be better compared to chemical pesticides (Abate *et al*, 2000; Corbels *et al*, 2000).

The majority farming practices that are followed by farmers especially in remote rural areas are believed to be traditional due to the fact that have been practiced over a long period of time and farmers are knowledgeable about these practices (Kuye *et al,* 2006). Commonly grown food crops under traditional agricultural practices especially in South Africa include legumes such as beans, cowpeas and ground nuts; cereals such as maize, sorghum and ground tubers such as sweet potatoes, *amadumbe* and potatoes, and a range of leafy vegetables which include pumpkins and some indigenous vegetables (Silwana *et al*, 2007; Mkhabela, 2006).

Following these practices farming communities were and are still able to feed their households and sustain their livelihoods. However, traditional farming is seen as backward, unproductive and non-commercial and more attention is paid to large scale farmers who are largely commercial (Lungu 1999; Kirsten and van Zyl, 1998). This view has however not stopped rural farming communities from producing their food crops based on traditional methods even when they have information about modern farming methods.

The main objective of this chapter is to review literature on traditional agriculture with a view to identifying the characteristics and analysing the most important factors that constitute traditional agriculture. The review helps in the development of the questionnaire for this study and analysis of some development recommendations.

The review is made up of three main sections. The first section highlights the socio-economic factors of traditional agriculture with emphasis on the social, economic and ecological contributions. The second section highlights the socio-ecological factors of traditional agriculture with emphasis on features of traditional agriculture and in contrast a snapshot of features of modern agriculture. The third part presents efficiency indicators of traditional agriculture; including empirical studies conducted.

2.1 Socio-Economic Factors of Traditional Agriculture

Traditional agriculture is more equated with smallholder agriculture where the majority of farmers produce from small plots of less than two hectares and use locally available resources to sustain their livelihoods. As a result, small-holder farmers play a multifunctional role in developing countries, contributing significantly to social, economic and environmental developments (Ongwen and Wright, 2007). Food crop production by small-holder farmers in developing countries is more than a challenge; the majority of farmers operate farming activities on marginal land with low potential for agricultural production; thus yields are generally said to be low (Ongwen and Wright, 2007; Benson, 2004). Despite the harsh challenges farmers face, small-holder production in less developed and developing countries continues to play an important role in lives of the majority of poor people (Ongwen and Wright, 2007; Andrew and Fox, 2004).

2.1.1 Social contributions of small-holder agriculture

Through small-holder agriculture, diverse and resilient societies are created in the sense that rural farming societies have networking strategies in order to cope with the challenges of farming activities. Networking strategies include: information sharing, provision of labour during peak periods and contributing significantly to the development of social ties among farmers and the community at large (Roberts, 2000). Rural farming communities do not work as individuals but rather as a group of people concerned with the sustainability of their livelihoods. During peak periods farmers depend on social networks provide labour for farming activities such as weeding and harvesting It is through these interactions that indigenous agricultural knowledge is passed from generation to generation thus contributing to social ties and

empowering the community (Ongwen and Wright, 2007; Harri, 1999). Small-holder agriculture not only contributes to social development but also to economic development of many economies of developing countries.

2.1.2 Contribution of small-holder agriculture to local economies

The backbone of most African, Asian and Latin American economies is dependent on agriculture, with the majority of people living in rural areas. About 70% of the food produced is from a small piece of land depending on available natural resources (Kirsten and van Zyl, 1998; Altieri, 1995). With the majority of small-holder farmers residing in rural areas, rural economies are dominated by these farmers and this has important ramifications for poverty alleviation (Ongwen and Wright, 2007). To support this view, a study conducted by Dorward *et al*, (2004) in India and Malawi revealed that small-holder agriculture is the backbone of many rural economies mainly because their produce is sold locally.

In most African countries, agricultural produce is mainly small-scale, yet also the biggest source of foreign exchange, savings and tax revenues. In Nigeria alone, agriculture contribute about 37% of Gross Domestic Product (GDP) and about 65% of adult labour is provided through agriculture mainly from rural farming communities (Kolawole and Ojo, 2007; Adedipe *et al,* 2004; Falusi, 1997). Other African countries whose agricultural production are mainly on a subsistence or small-scale basis but contribute significantly to their economies include Kenya and Tanzania that produce a number of cash crops mainly coffee and tea. The majority of farmers in these countries have small individual plots and depend largely on family labour to carry out farming activities (Ontita, 2007). Similarly the contribution of small-scale farmers or farming in Latin America communities is significant, contributing about 41% of agricultural output for home consumption for crops such as maize and beans (Altieri, 1991). On the other hand, while small-holder farming plays an important role, the majority of these farmers are women who produce food crops mainly for subsistence and sell surplusses in order to meet other capital demanding responsibilities, thus playing a significant role in upholding the household economy (Verma, 2001, Darley and Sanmugaratnam, 1993).

In South Africa, the contribution of agricultural produce in the context of small-holder farmers is viewed as insignificant largely because small-scale farming or rural farming is still perceived as backward, unproductive, non-commercial and largely associated with African farmers who dwell in rural areas. Moreover, the majority of these farmers produce from small pieces of land of not more than two hectares around their homestead depending largely on available locally resources with limited applications of external inputs (Manona, 2005; Kirsten and van Zyl, 1998; Lyne and Nieuwoudt, 1991). These farmers are said to produce mainly on a subsistence basis although surpluses are sold to generate income (Mkhabela and Materechera, 2003).

The perception that small-holder farmers in South Africa mainly produce on subsistence-basis was challenged in the study conducted by Makhanya (1997). Small holder farmers in KwaZulu-Natal engaged in sugar cane farming produced about 60 tons per hectare and were contracted to Illovo for processing their produce. This was done with the notion of rural development in the country based on agricultural development.

2.1.3 Ecological considerations of small-holder agriculture

Traditional farming methods are intricately linked to nature, with ecological considerations playing a vital role. Through multiple cropping patterns, land use and nutrient management, farmers have wealth of ecological knowledge which helps in sustaining their production systems (Dollo, 2007). With dependence on human labour, small-holder agriculture also contributes to saving the environment for future generations to use since fossil-energy is largely avoided, thus contributing less to climate change (Pimentel *et al*, 2005; Pretty and Hine, 2001).

Although it is true that the majority of farmers in a rural context farm from small piece of land, it is equally important to note that over centuries these farmers have developed diverse farming systems adapted to these local conditions. Farming systems are based on traditional farming methods and is significantly shaped by reliance on indigenous agricultural knowledge (Xiubin *et al*, 2007; Altieri 1995). It is thus important to understand what is viewed as traditional agriculture.

2.2 Socio-ecological factors of traditional agriculture

Understanding traditional agriculture is crucial since it means understanding the people who practice it, their indigenous knowledge, as well as their understanding of the surrounding environments that sustain their production system (Sen *et al*, 2002). Most definitions of traditional agriculture are centred on features that mainly describe this agriculture. Commonly cited features of traditional agriculture in literature include; agro-ecological methods, indigenous agricultural knowledge, use of manual farming implements, use of family labour for all farming activities and a subsistence orientation (Dollo, 2007;Kaihura and Stocking, 2003; Reij and Waters-Bayer, 2001; Altieri, 1999; Altieri and Rosset,1997 Altieri and Anderson, 1986). Through these features many farming communities have been able to develop agricultural systems designed to optimise productivity in the long run, managed with time tested indigenous innovations adapted to various circumstances as well as geographical locations. Farmers have managed to meet their subsistence needs, thus ensuring sustainable livelihoods and food security (Fawole and Oladele, 2007; Kuye *et al* 2006; Abate *et al,* 2000; Gliessman, 1998; Altieri, 2002; Altieri, 1987).

Even though these systems have sustained rural communities over centuries, like in any agricultural system, traditional farmers have been confronted with farming problems such as disease outbreaks, droughts and declining soil fertility. These problems allowed farmers from following these practices but instead developed unique management systems to overcome these constraints (Xiubin *et al*, 2007; Altieri, 1995; Altieri, 1987:71). Despite these efforts by traditional farmers, traditional agriculture is often considered to be primitive, unproductive and cannot meet the demands for increased food production (Lungu, 1999, Altieri, 1995).

2.2.1 Traditional agriculture as a generic farming system

In order to sustain their production system, farmers have acquired knowledge about the environment and the features of resources available. This knowledge has helped farmers to develop methods suitable for their conditions and their production systems (Nautiyal and Kaechele, 2007). Traditional agriculture like other farming systems has means and practices that are followed to ensure agricultural production. How

resources are used and decisions taken in a farming system, is the responsibility of the farmer resulting in optimal outputs.

Use of resources is directed by inputs, processes and outputs in traditional agriculture (Altieri, 1987). Inputs are readily available resources to the farmers and can be categorised into natural, human, capital and production resources. Natural resources are all the given elements of land, climate and natural vegetation that are exploited by the farmer for agricultural production (Kaihura and Stockings, 2003; Altieri, 1987:31).

Human resources include all the people responsible for farming activities. This is in the form of labour, decision making and knowledge inputs and these form the greater component in processes within a farming system. Capital resources include all the resources that need to be brought into the farming system and these include farming implements, fertilisers and crop protection technologies. Production resources refer to the main agricultural output of the farm such as crops or the harvest (Altieri, 1987). Although production in traditional agriculture is said to be low, farmers save a lot of resources because the majority of their production is based on family labour. Agricultural labour through family members has high return input with high energy return (Altieri, 1999). There are many examples of traditional agricultural systems from Asia, Africa and Latin America and all these systems share similar features.

However, though traditional farming methods seem to be sustaining livelihoods of the majority of rural people, it is also anticipated like in any agricultural system there are weaknesses and shortcomings. Due to prolonged use of traditional farming methods, land resources are degraded leading to low productions, soil erosion and other environmental concerns (Chimbidzani, 2006;Iyegha, 2000)

2.3 Features of traditional agriculture

As mentioned in section 2.2, commonly known features of traditional agriculture include; agro-ecological methods, indigenous agricultural knowledge, use of family labour for all farming activities, use of manual farming implements, and subsistence orientation (Dollo, 2007; Kaihura and Stocking, 2003; Reij and Waters-Bayer, 2001; Altieri, 1999; Altieri and Rosset,1997 ; Altieri and Anderson, 1986).

2.3.1 Agro-ecological food production methods

Traditionally, farmers make use of resources available in their farming environment and these resources are well matched to maintain production (Akande *et al*, 2006; Makhabela, 2006; Tire, 2006). With the use of locally available resources farmers have managed to maintain their small-holder agriculture over a long period of time. For example, in Sudan and Zaire farmers noticed that termite mounds are very good for growing sorghum and cowpea, while farmers in Mexico use ant refuse as fertiliser for crops such as tomato, chilli and onion (Reijntjies *et al,* 1992). Methods followed by traditional farmers mimic ecological processes and include traditional tillage practices, multiple cropping systems and use of local varieties (landrace seeds) (Berkes *et al*, 2000; Altieri, 1999).

- **Tillage**

The majority of traditional farmers in developing countries use indigenous tillage systems. These systems are low cost, locally and culturally adapted technologies based on indigenous knowledge and reflect considerable knowledge of sustainable agriculture (Rajaram *et al,* 1991). Most tillage operations are performed manually using a hoe or animal drawn plough. In comparison with other developing countries, Sub-Saharan Africa ranks the lowest when compared to China, India and Latin America in terms of using animal drawn farming implements or mechanised implements; thus human labour is very intensive (Riches *et al*, 1997).

Minimum tillage has been used historically by traditional (and deemed primitive) farmers for the production of food crops. In the Pacific Islands traditional farmers practice minimum tillage farming techniques, where farmers normally clear the land manually using hoes and planting sticks (oso) which are large enough for the planting material (Tofinga, 2001; Tomane, 2001). A similar practice was observed in Tanzania and differs slightly since a hand hoe is used to open small planting pits and the technique is an efficient way of assuring crop survival when rainfall is inadequate (Elwell *et al,* 2000). Tillage activities remain labour intensive since farmers use manual farming implements (Verma, 2005).

Throughout the world, traditional agriculture is characterised by multiple cropping patterns in the form of intercropping and traditional crop rotations. Cropping patterns have a major contribution in describing the farming methods followed by particular farming cultures. Cropping involves various stages with each stage demanding different decisions and the use of different inputs. (Meertens *et al*, 1995).

- **Intercropping**

Intercropping is widely practiced in Africa, Latin America and Asia and is considered as a means of increasing crop production per unit land area with limited resources especially limited external inputs with minimal risk of total crop failure (Vandermeer, 1989). Due to the cultivation of two or more crops on the same piece of land, intercropping is also viewed as a crop intensifying strategy aimed at minimising crop failure, stabilising yields, diversity and soil nutrients fixation especially when crops intercropped include legumes (Liebman and Dyck, 1993).

Intercropping patterns in traditional agriculture include intercropping legumes such as cowpea, chickpea, groundnuts, beans and pigeon-pea with cereals such as sorghum, millet and maize (Tsubo *et al,* 2003; Dakola and Keya, 1997). Cereal crops are good competitors with weeds; thus for traditional farmers intercropping is also a weed management strategy since weeding is labour intensive and herbicide use is not an option for them due to costs (Poggio *et al*, 2004; Liebman and Davis, 2000).

Intercropping is practiced in many countries where traditional agriculture is still the dominant form of agriculture. For example, in Zimbabwe traditional farmers grow beans and pumpkins together with maize as the main crop. Farmers view this practice as the most important since they are able to increase yields, improve soil fertility as well as minimise risk against losses due to uncontrolled environmental factors such as droughts, and diseases (Maponga and Muzarambi, 2007; Chivasa *et al,* 2000). Intercropping is viewed as the cultivation of two or more crops on the same piece of land and is practiced in many traditional farming systems (Tofinga,2003; Iyegha, 2000).

In a study conducted by Makhabela (2006) in South Africa (KwaZulu-Natal), it was found that maize-based intercropping system was the dominant cropping system with intercrops being maize/beans/potatoes/pumpkins among small-holder farmers. Other

farmers viewed intercropping in ecological terms where resource use efficiency was the main aim (Altieri, 1987).

Plants, when occupying the same piece of land, increase the possibility of competition for important resources like water, nutrients, sunlight and land. Crops with different structures assist each other very well; for instance when intercropping plants with canopy structure, the soil is protected from losing moisture; as a result benefitting those plants that need water most (Geno and Geno 2001; Iyeqha, 2000). It is clear from the above stated benefits and reasons for intercropping that farmers are aware of these benefits; thus influencing the continual practice of this cropping pattern.

Despite all these benefits of intercropping, there are some disadvantages associated with it. The fact that different crops are grown on the same piece of land, normally means that these crops ripen at different times thus the system is labour intensive since harvest continues until the last crop is harvested. Weeding is difficult since there are no distinct rows, and weeding is mainly manual which can also contribute to damaging the roots of main crops. Sometimes weeding is impeded due to the intensity of labour needed (Iyeqha, 2000).

In a study conducted by Nuwabaga *et al* (1999), it was found that farmers practice intercropping for other reasons such as increasing food security, inadequate land, increased yields, to get food for their households, to sell surplus for income generation and reduce risk of crop failure. Farmers also perceived intercropping as inexpensive since other inputs such as labour and time can easily be invested in growing different crops on the same plot. On the other hand, some farmers perceived intercropping as leading to low yields.

Farmers in developing countries were largely discouraged from practicing intercropping as it was viewed as an inefficient, primitive and unproductive system (Akande *et al,* 2006). Instead farmers were encouraged to follow mono-cropping farming systems that have largely failed due to high demands for external inputs (Iyeqha 2000; Liebenberg 1997; Lofchie and Commins, 1982). However this thinking has and is increasingly challenged due to increased emphasis on ecological stability (Liebenberg, 1997). While intercropping, farmers are also aware that planting the

same crop at the same spot repeatedly without changing, the soil nutrients are depleted. As a result of this consideration another cropping system known as crop rotation is followed.

- **Crop rotation**

Crop rotation involves growing different crops in a recurring sequence on the same piece of land while intensifying food production (Liebman and Dyck, 1993). Traditional farmers consider crop rotation for a number of benefits including maintaining soil fertility, weed suppression, yields stability and minimizing risk. Farmers view soils as an entity that grows mature and become old as a result cultivating the same crops on the same spot for a long period resulting in poor soils with depleted nutrients (Pound and Jonfa, 2005; Norton *et al,* 1995).

In order to maintain soil fertility, farmers rotate crops that require more nutrients from the soil with those crops that require fewer nutrients from the soil. Farmers are aware of the different demands of nutrients by crops though they do not know which nutrients; thus in most cases when rotating crops they consider root structures of crops to be rotated. In such cases deep-rooted crops such as tubers are normally rotated with shallow rooted crops such as legumes or with crops that do not bear in the ground but rather above the ground (John, 2004). Rotating crops in this fashion has helped farmers to minimize risks of crop failure since disease outbreaks were minimised and soil fertility was maintained (Pound and Jonfa,2005).

Not only did small-holder farmers practice crop rotation for soil fertility but have exploited this system for centuries to stabilize and increase yields (Norton *et al,* 1995). Most importantly crop rotation is traditionally regarded as a strategy to control pests, diseases, insects and weeds. With regard to controlling pests, small-holder farmers realised that growing crops of the same family in succession perpetuates pests, insects and diseases; as a result to overcome this problem, crop rotation was the solution (John, 2004). Following crop rotation practices, serious weeds can be controlled since new conditions are introduced that can affect weed growth and reproduction thus contributing to reduced weed densities.

In a study conducted by Nuwabaga *et al* (1999), in Tanzania, it was found that farmers practice crop rotation to improve soils and that the system was less labour

intensive. It is thus important to understand the reasons behind following certain practices within a farming system.

• Traditional Planting methods

An understanding of cropping patterns followed by farmers under traditional farming system is not complete until planting methods and seed systems followed by these farmers are also understood.

Traditional planting methods demonstrate the processes followed in intercropping and crop rotations. Due to the fact that intercropping involves planting several crops together on the same piece of land, farmers normally mix different seeds together before planting (Hunduma, 2006).

Planting is one of the laborious activities in traditional agriculture since it is mainly manual. In most cases, seeds are broadcast before soils are turned over in order to reduce labour demands. (Akullo *et a*l, 2007). This practice is limited to small seed crops such as legumes, cereals and pumpkins while for tuber crops this is difficult as tubers might be damaged when soils are turned. In cases where animal traction is used, when the ox-plough is busy turning the soil, women follow with hoes digging small holes to bury the seeds and use the hoe to cover such buried seeds (Corbeels *et al*, 2000). Although this method is seen as labour intensive due to the fact that planting is manual, farmers know the benefits associated with seed broadcasting. In Ethiopia, an agronomist tried to persuade farmers to follow line planting without success because farmers knew that when seeds were broadcast weeds are suppressed due to higher plant densities (Mutimba, 1997).

Apart from broadcasting seeds, some farmers use planting sticks to make holes in the soil and put two or three seeds. Once the seeds are in the hole, a farmer will use the sole of the feet to stamp the hole. This is an indigenous technique mainly used in India, Gambia and Uganda. Putting more than one seed per hole is a risk minimising strategy, in case one seed fails to germinate or grow, the other might survive.

What is more interesting with traditional farmers is that it is a common phenomenon to encounter both farmers' varieties and modern or improved seed varieties with the majority using local or landrace seeds. Landrace seeds are crop varieties whose

genetic diversity are shaped by household agronomy practices and have been grown and selected by farmers over generations of cultivation (Smale *et al*, 2001; Bellon and Brush 1994).

Landrace seeds are genetically diverse and economically valuable since they provide global biodiversity for future crop production and can resist harsh environmental conditions (Hunduma 2006). Landrace seeds are locally selected; thus farmers rely heavily on local supply systems that involve local production, seed exchange which is in turn integrated into socio-economic processes of farming communities (Almekinders and Louwaars, 1999). Tripp (1997) indicated that farmers choose seed varieties based on their needs.

- **Local seed systems**

Traditional farming systems are characterised by local seed systems that are very important for food production. The majority of these local seed systems operate at community level and are said to be informal, where exchange of limited quantities of seeds took place (Mekbib, 1997). In many traditional farming systems it is a common practice that farmers produce their own seeds or ask from neighbours or other farmers and relatives (Scott *et al*, 2003; Chirwa and Aggarwal, 2000; Gemeda *et al*, 2001; Almekinders *et al* 1994). These seed acquisition methods are involved in social relationships. Seeds are not often given as free gift but rather serve to reinforce social ties (David and Sperling, 1999). Other sources of seeds are markets which are mainly for improved varieties (Friis-Hansen, 1995).

While seed acquisition methods are important, farmers also have ways of selecting seeds. In a study conducted in Zimbabwe farmers indicated that they mainly select their seeds at the homestead after harvest because plants look the same in the fields (Chigora *et al*, 2007). Once seeds are selected, they are stored separate from the harvest used for home consumption (Chigora *et al*, 2007; Efa *et al*, 2005). Farmers are in the position to maintain stored seed throughout the year by replacing old seed stock with fresh seeds after each harvest. In other words farmers have seed enough even after planting. Following this method, even in the event of harvest failure due to harsh environmental conditions, there is seed enough for the coming planting season (Longley *et al*, 2001). However, since local seed systems involve exchange of seeds between household the major disadvantage could be that households that do not

belong to such social networks may be excluded. It should also be anticipated that the sustainability of local seed system worldwide is questionable due to changes in agricultural production, markets and population growth (Lipper *et al*, 2005).

2.3.2 Reliance on manual farming implements

Over a long period of time traditional farmers have relied on different farming implements to prepare land and to some degree, some of these implements are still in use today. These implements are locally made by local craftsmen. For many traditional farmers, hoe and animal drawn ploughs are their main farming implements.

- **The hoe**

A hoe is the used implement for multiple purposes primarily for tillage, and for weeding (Suma *et al*, 2004; FAO, 1999). Traditional tillage is mainly manual and consists of human muscle as the source of energy accounting for 89% of doing the work of primary cultivation. Farmers use the hoe to break topsoil crust and at the same time conserving soil moisture since soils are not very deeply turned when compared to using mechanised implements (Nyagumbo, 1998).

In Africa the traditional hand hoe has evolved locally over a long period of time based on soil conditions and farming activities to be carried out. There are different types of hoes: the traditional chop-down-and pull type, short handled and long handled hoes (International Fund Agricultural Developemnt (IFAD), 1998). Long handled hoes allow the farmer to work while standing upright while the short handled forces the farmer to work in almost a crouching position. In Senegal, the long handled hoe is locally known as *hilaire* There are three common ways of the way a hoe is fitted to the handle: tang fitting, where the tang is usually bent through the bulbous end of the handle, the socket fitting, where the tang is bent into a circular-shaped socket; and lastly the eye-ring fitting where the handle is inserted into a forged ring right at the top of the blade (Slama, 1998). Similarly, farming in Togo is manual using a large hoe and a small hoe. The large hoe is L-shaped with a tree branch fitted to a spade-shaped steel plate and it is primarily used to turn over the land into lines suitable for cultivation; small hoes are of the similar shape but are mainly used in home gardens and weeding (Gurganus, 2004). In Gambia traditional tillage involves a variety of

hoes with different uses. A *dabajango* is a long hoe used by women for cultivating rice fields; a *konkoduwo*, a shorter hand hoe used for planting, a *falajango*, short hoe for making planting holes (Kuye *et al*, 2006).

However, despite the heavy dependence on the hoe in traditional agriculture as the most available and accessible farming tool, many women especially in Africa have levelled complaints against the hoe. The design of the hoe imposes severe limits to production, because of its mainly short- handled use in a squatting or crouched position; thus many complain that it causes back pain (FAO,1999; Kuye *et al*,2006). One of the main objections to the hoe is that is it considerably heavy though seldom realised. A study by Nag and Nag (2004) found that in India, farmers who uses hand hoes are subjected to minor injuries that can be fatal if left untreated for extended periods of time.

- **Animal drawn implements**

Although the hoe is the dominant farming implement in traditional agriculture, there are some traditional farmers who also use animal drawn implements. Animal drawn implements are also common in many traditional farming systems; however, ownership of animals such as bullocks and donkeys determine the possibility of using such implements (Kuye *et al*, 2006). Animal drawn implements are still in use today, although with varying challenges. In a study conducted by IFAD (1998) in five African countries, it was found that animal traction was dominant in Senegal while in Uganda, animal traction was used in both the southern and northern parts of the country but due to tsetse fly which causes diseases in animals, farmers do not keep lot of livestock. Animals that are used include oxen, cattle and horses in some cases.

Another limiting factor in using animal traction in traditional agriculture is some gender based taboos. In Africa, particularly in some parts of Uganda and Zambia, women are not allowed to work with animals. On the other hand, some women can do so but are not allowed to fetch cattle from the kraal (IFAD, 1998).

Other limiting factors of animal drawn implements are that they are heavy and need skills to operate them and require lot of effort, thus difficult to use by women. Animal drawn farming implements include the ox plough and sine hoe (Kuye *et al*, 2006).

Therefore, it is clear why the hoe is the most common traditional farming implement used for various farming activities.

Although manual farming implements are prevalent among traditional farming systems it should also be noted that due to considerations of reducing labour burdens, some farmers do use mechanised implements such as tractors (Riches *et al*, 1997). However, the biggest challenge of using mechanized implements is associated with lack of skills and capacity of ownership; this results in paying to hire tractors (Karmakar *et al*, 2001).

2.3.3 Dependence on indigenous knowledge

Many small-holder farmers rely on indigenous, locally developed innovations to sustain their farming systems. Traditional innovations are often developed by groups of farmers in order to survive in marginal and challenging environments (Hart, 2005). These innovations are also developed through careful observations, experiences and trial and error experiments aimed at sustainable food production systems based on local or indigenous knowledge (Altieri, 1990). This successive transfer of information across generations has resulted in the production of a system of understanding natural resources and relevant ecological processes (Desbiez *et al*, 2004; Pawluk *et al*, 1992). Rich indigenous agricultural knowledge on how to identify soils good for crop production, manage soils and crop protection methods is passed from generation to generation among household members and among local farmers (Kuye *et al*, 2006; Maonga and Maharjan, 2003; Kirsten and van Zyl, 1998).

- **Soils identification and management**

Understanding the central role of soil resources in subsistence production as a non-renewable resource is a major aspect of sustainable agriculture; thus the indigenous knowledge of soils is of paramount importance for the resource-poor farmer (Pawluk *et al*, 1992). Farmers identify soils good for crop production based on a number of categories. These include soil colour, texture, prevalence of weeds, and workability under dry and wet conditions (Maonga and Maharjan, 2003; Corbeels *et al,* 2000). The understanding of these ecological principles has also contributed to farmers having names for different soils. Such nomenclature implies association of soil characteristics with suitability for specific crop production.

- **-Soil colour and texture**

Soil colour and texture are the most prevalent indicators used by traditional farmers throughout the world. Through the use of these indicators farmers are able to tell which soils are best for crop production (Barriors and Trejo, 2003).

In Nepal, resource poor farmers also classify their soils more according to colour and texture and have local names for such soils. *Seto mato* and *kalo mato* refer to both white and black soils which are highly valued by farmers. Through these indicators farmers were able to determine soil fertility levels, manure requirements, erosivity and water retention properties (Desbiez *et al*, 2004). However, in Latin America resource poor farmers perceive soil texture as the most important indicator of soil fertility (Barriors and Trejo, 2003).

Other countries in Africa such as Zambia, Tanzania and Ethiopia also perceive soil colour and texture as main indicators of soils suitable for crop production. In Zambia soil colour is the main feature of soil fertility, with red soils described by farmers to be very fertile and have traditional or local names. These red soils are known by farmers as *chilambe, chipana, katondo, moluwe* and *nkanka wa kashika*. Black soils are also regarded as fertile to moderately fertile and also have local names known as *utife*, *wa fita and chundu* (Sikana, 1993). In WaSukuma,Tanzania, the potential and weaknesses of different soils are reflected in a unique and rich indigenous soil nomenclature. Soils best for growing groundnuts are known as *mashikaranga*, while *itogolo* means soils not suitable for cultivation (Ngailo *et al*, 1994). In Tigray, Ethopia farmers distinguish between four different types of soils also based on colour and texture. Black clayed soils are known as *walka*, reddish medium textured known as *keyih meriet,* brownish medium texture soil as *andelewayi* and light coloured lightly textured as *bahakal*. *Keyih meriet* is the most fertile soil while *walka* is the least fertile soil (Hunduma, 2006). Moreover dark coloured soils are known for their capacity to absorb more solar energy thus easy to warm up (Brady and Weil, 1999).

-Weed abundance and moisture retention

Weed abundance is also regarded as one of the indicators of soil fertility. Farmers observe the occurrence of a particular weed in some soils over time and should the abundance of such weeds decrease even when rains are good then farmers know that

their soils are exhausted (Hunduma, 2006; Corbeels *et al*, 2000). Such knowledge of soils characteristics has also contributed to farmers' knowledge of declining soil fertility and how this can be challenged (Corbeels *et al*, 2000; Shapiro and Sanders, 1998).

The capacity of the soil to retain moisture is also valued as an important indicator. Farmers perceive thick, soft soils as having the capacity to hold water and have discovered that crops perform well in such soils (Barriors and Trejo, 2003). Given the central role of locally available resources in traditional agriculture, and the fact that these resources have varying importance to farmers, soil as a non-renewable resource is highly valued as the life of the farmer is dependent on it (Ettema, 1994). Farmers, therefore have various ways of maintaining their soils so as to face the challenges of declining soil fertility.

-Soil fertility management

The majority of traditional farmers use kraal manure to maintain their soils. Kraal manure is a locally available resource. Kraal manure is essentially an organic material consisting of residues of plants that were digested by animals in a kraal and is high in potassium but also contains phosphorus and nitrogen. Kraal manure increases the humus of soils by 15-50%, depending on soil type, increases soil aggregate stability, root permeability and enhances soil fertility (Kimani and Lekasi, 2003). Though manure is locally available, it is often a scarce resource and farmers use it strategically. The commonly used fertiliser in traditional African agriculture is cattle manure. Animal kraals are normally around homesteads not far from fields. This causes farmers to have to carry manure to the fields (Pound and Jonfa, 2005). Farmers normally apply manure to fields near homesteads while little application is observed in fields away from homesteads. This is partly because the transportation to fields far away from home is labour intensive walking long distances to the fields carrying manure (Tittonell *et al,* 2005; Mtambanengwe and Mapfumo, 2005).

Despite the reliance on the use of manure as the main soil fertility resource, collection and application of manure is labour intensive resulting in inadequate applications for large farms and for households with little livestock. Serious labour bottlenecks can be experienced during the transportation and application of manure to the fields. Means

of manure application varies from country to country but the aim for all farmers is to improve their soils (Graves *et al*, 2004; Enyong *et al*, 1999). An example of such a difference was observed with Ethiopian farmers where a kraal manure collection and soil fertility strategy was to allow livestock to graze on different parts of a cropping field, changing livestock from areas until the whole field was treated. Some farmers who do not have livestock contract livestock from livestock farmers so as to treat their lands (Enyong *et al*, 1999).

In a study conducted over a period of ten years in Tigray (Ethopia), it was found that traditional methods of manuring and compositing was more effective in producing yields higher than those from chemical methods. What is important with this study is that though chemical methods are stressed as alternative sustainable methods to be followed, traditional methods still prove to be more important to farmers (Lim Li Ching, 2006). In another study conducted in South Africa by Mkhabela (2006) it was found that manure use is an old soil fertility technology. Livestock is kept in kraals overnight manure accumulates in the kraal, is left there for the whole year and only applied in fields during dry seasons.

The two studies described above shed light as to different manure collection systems but most importantly what can be drawn from these studies is that limitations of manure use thus exist. Farmers without livestock cannot access this resource readily thus exposed to the challenges of declining soil fertility.

Not only is kraal manure an available resource to farmers but so also is chicken manure. In a study conducted by Maragelo (2006) it was found that traditional pumpkin farmers in Embo mainly used chicken manure to fertilise soils for pumpkin production. Similar studies also showed that crops like cassava, maize, pumpkins and melons produce improved yields when chicken manure is applied (Ayoola and Adeniyan, 2006; Agu, 2004).

- **Traditional plant protection practices**

Traditional crop protection technologies were designed by farmers through centuries of trial and error, natural selection and keen observation, and have existed ever since people have cultivated crops and some are still in use today. Crop protection is

achieved through the use of home-made ecologically friendly technologies. These technologies meet the basic needs of farmers and are adapted to various circumstances and environments (Abate *et al*, 2000; Altieri, 1995; Matteson *et al*, 1984). Reij *et al* (1996) indicate that the assessment of these technologies shows tremendous increases in yields and sometimes higher than yields in modern agriculture. Farmers need to protect crops against pests, diseases, weeds and physical damage from the environment.

Intercropping is viewed as one of the best traditional crop protection practices. In an intercropping system, one crop acts as a diversionary host, protecting other crops from serious damage or diseases. Such practices were observed in Kenya and Tanzania where farmers intercropped maize with sorghum and legumes. The pests were diverted to mainly to maize with high yields of legumes and sorghum in return (van Hius and Meerman, 1997; Matteson, *et al,* 1984).

Farmers have a good ecological understanding of easily pests observed; thus there are varying methods to control pests of various forms such as birds, locust and stemborers, cutworms and beetles (Tantowijoyo and van de Fliert, 2006; Abate *et al*, 2000). In several African countries birds cause substantial losses to cereal crops and farmers have traditional ways of protecting their crops against such pests. Birds destroy crops such as millet and sorghum. Strategies used by farmers to protect crops include bird watching and devising scarecrows. In Senegal, farmers cover heads of ripening sorghum with cloths, grass or leaves to protect from birds damage, thus losing very small percentages of crops to birds (Ruelle and Briggers, 1982). A similar practice was reported in Gambia, where boys watch crops against birds' damage, while making noise from intermittent shrill sounds, scarecrows, and cutlasses (Kuye *et al*, 2006).

Apart from birds, crop losses come from locusts. The desert locusts (*Schistocerca gregaria*) together with many other locust species are migratory pests that farmers are fighting to reduce crop losses. Estimates of up to 90% crop losses caused by locusts in the Sahel zone, Africa. To control such pests, farmers follow traditional methods. For example, farmers in Nigeria developed a control method against grasshoppers by marking out egg-laying sites, then dig up these eggs and expose them to the sun (Abate *et al*, 2000; van Hius and Meerman, 1997; Richards, 1985). However, though

these pests can cause such losses, there are some socio-economic benefits derived by farmers. For pests such as the giant grasshopper and caterpillars, farmers have developed socio-economic benefits since these pests are consumed in various traditional settings. These pests are allowed to settle in a field and in the evenings, villagers go out to harvest them from the fields (Abate *et al,* 2000).

On the other hand considerable losses are caused stemborers, and cutworms which mainly damage maize, sorghum, millets and tubers such as potatoes. Through some indigenous innovations farmers are successful in reducing losses from these pests. For example in Uganda it was found that farmers use concoctions of plant materials for plant protection. Farmers in Uganda use a traditional shrub (*Tephrosia spp)* as a pesticide to control stemborer in maize (Akullo *et al,* 2007; Tantowijoyo and van de Fliert, 2006; Abate *et al*, 2000). In study conducted in eastern Kenya small-holder farmers were found to use ash mixed with fine soil or a combination of soil, ash and tobacco as a local strategy to control stem borer especially in maize (Ouma *et al*, 2002).

Biological pest control is an indigenous practice that has been in practice for a long time. In China a study conducted by Apantaku (2000) found that farmers placed nests of predacious ants in orange trees to reduce the insect damage. Similarly, Indian farmers plant sunflower and wheat together so to regulate the bio-control of owls and rats at the stage of grain development where owls are attracted by sunflower. A key feature of most of these practices is that they are derived from locally and readily available natural resources and farmers are able to save crops from damage by various pests.

In order to protect crops against losses from natural damage such as drought, heat or cold weather, traditional farmers are known to use landrace seeds which are often seen as low yielding but the biggest advantage that farmers derive from landraces is that landrace seeds often have a certain degree of resistance to diseases and harsh environmental conditions (Hintze, 2002; Lenne, 2000).

Early planting is an indigenous farming method practiced and is also preferred as it allows crops to receive enough rainfall, thus pest and disease incidents are reduced.

This method is very important especially in traditional farming since such farming is mainly rain-fed (Akullo *et al*, 2007; Modi 2003).

Farmers lose large amounts of their crops due to weeds in their fields. Shortages of labour can result in serious weed infestation not being removed fromfields, thus yields being decreased since weeds compete with crops for important resources such as water, nutrients and sunlight (Matteson *et al*, 1984). The primary method of controlling weeds in developing countries is hand weeding. Hand weeding is an old strategy prevalent in many traditional farming systems. It is normally carried out by women and children including hired labour. Hand weeding is done by manually pulling the weeds out among the crops or by using a hoe. Weeds are normally removed when still young to avoid competition for soil nutrients with the crops. Although the majority of farmers prefer hand weeding as the effective way of removing weeds, hand weeding is slow. This is aggravated when there is limited labour available because it is done from morning till evening in a squatting position, thus labour and energy intensive. By the time the farmer finishes weeding the plot, weeds have started growing again where weeding was first started (Iyeqha, 2000; Joubert, 2000; Shimba, 2000). On the other hand, hand weeding is efficient since there are no capital resources required especially when weeding is done by family labour (Shimba 2000).

In a study conducted by Suma *et al* (2004), among Indian women farmers, it was found that weeding is performed for most days of the season mainly in a crouching position because of using a short handed hoe. Women perceived the work as light to moderately high. Animal drawn weed control is also used by some traditional farmers but the limitation of using this method is that traditional farmers practice intercropping; thus it is difficult to move animals among crops (Joubert, 2000; Shimba, 2000).

2.3.4 Reliance on human labour and energy use

Human labour and energy are needed in order to ensure the optimal operation of various cropping patterns. It is in this context that farmers in the majority of traditional farming systems rely mainly on family labour to carry out farming activities (Stone *et al*, 1990). Many of the processes within cropping systems are carried out by hand. Once a cropping system is established, farmers know what kind

of labour is needed for land preparation, planting crops, weeding, crop protection and harvesting. Each of these activities has a variety of labour demands. However, the most labour demanding activities are land preparation, weeding and harvesting (Altieri and Nicholls, 2004; Pimentel *et al*, 2005). It is important to consider that even though labour demands for the abovementioned activities are high, farmers are able to spread labour over time without incurring extra cost especially for hired labour during peak periods (Geno and Geno, 2001; Altieri *et al*, 1998). In a nutshell, based on these factors, agricultural labour has a relatively high return per unit of input.

To understand labour demands for various farming activities, labour should be seen as an element of central importance in a farming system and also as a social aspect that can be applied strategically to increase farm production (Stone *et al*, 1990). Division of labour in any society is a social entity and can vary among societies, cultures and ages. In a farming context, gender specific roles are often the result of the household structure, access to resources and ecological conditions (Doss, 2001).

- **Land preparation labour demands**

Land preparation which include clearing land, ploughing and digging is carried out at the onset of first rains mainly by male farmers (Lu, 2007; White, 2003; Verma, 2001; Barrow, 1994). Men are thought to perform technical and labour intensive tasks in farming activities; thus land preparation is generally considered a labour intensive task performed by men (Koli and Bantilan, 1997). Although men seem to be the main actors in land preparation, it is also anticipated that women tend to be taking over this task due to labour migration and the fact that small-holder farming in most developing countries is dominated by women (White, 2003; Verma, 2001).

- **Planting activities**

Labour for planting activities is mainly supplied by women since in traditional farming systems as men are busy ploughing, women follow broadcasting or inserting seeds in soils (Kuye et al, 2006).

- **Weeding**

Weeding as a weed control strategy is mainly carried out by women and children and whenever labour bottlenecks are experienced, outside labour is sought (Hunduma, 2006; Iyeqha, 2000; Joubert, 2000; Shimba, 2000).

It is also a common practice among traditional farmers that farmers help each other during peak agricultural periods. In a study conducted in Ethopia by Hunduma (2006), it was found that farming families have traditional working groups that perform different farming activities for different reasons. There is a *fulbaasii/qaboo* group working for one farmer for half a day especially when a farmer experiences sickness or death of a family member during peak periods. *Kadhaa* is a group that is asked to help during ploughing or weeding and harvesting. This group can also help with other tasks such as house construction. The same pattern was observed in Gambia in a study conducted by Kuye *et al* (2006), group such as *dadala* which is a group of young strong men, and another group was the *kafo* which is made up of either males or females. These groups are not paid in cash but the hosts provide them with food and drinks and sometimes pay them with a bullock.

Traditional farmers, like other farmers, are more concerned with the outputs since this is where the importance of inputs invested in a farm is evaluated. When conditions favour them, farmers expect a good harvest from their fields. However harvesting is a very labour intensive activity especially in traditional agriculture and regarded as the first step in crop processing (Iyeqha, 2000; Helmer *et a*l, 1986). It is noteworthy to consider how different crops are harvested, processed and who is responsible for harvesting activities.

- **Traditional ways of harvesting and storage methods**

Common grain crops produced in developing countries of Africa, Asia and Latin America include sorghum, millet, rice and maize. Grain crops such as maize are traditionally harvested manually by hand, knives or dislodging cobs from the standing stalks. Maize once harvested, is either shelled or left unshelled. Further processes include shelling. Shelling involves pressing the grain off the cob with thumbs or rubbing the two cobs together. These harvesting processes are also labour intensive and for the majority of traditional farmers such activities are carried out by women (Kuye *et al,* 2006; Byerlee, 1994).

In developing countries, tubers are important staple foods. Commonly grown tubers include taro, cassava and sweet potatoes. The biggest challenge facing traditional farmers is how to harvest and process these since the majority of tubers have a short

shelf life. As a result farmers devise some ingeneous harvesting and storage methods (Akollo *et al*, 2006; Srivastava *et al*, 2006; Bridges, 1996). In order to overcome this challenge farmers normally harvest tubers such as sweet potatoes through piecemeal methods. Only the quantity required for consumption is harvested while the rest is left under the soil (Akollo *et al*, 2006; Srivastava *et al*, 2006; Bridges, 1996).

Legumes play an important role in the diets of many people in poor countries because of the high protein content they posses; as a result many farmers produce legumes such as beans, cowpea and chick-pea. The majority of traditional farmers harvest legumes such as beans through traditional methods. Harvesting legumes is labour intensive since farmers have to remove the pods from the plant, thereafter thresh the pods to remove legumes, followed by winnowing to remove chaff and all small particles before final hand cleansing. Once legumes are cleaned then they have to be stored for later use. Storage of legumes is the most challenging issue for farmers. Bruchid beetles are major pests for legumes as they feed on the protein content of legumes (Songa and Rono, 1998).

Farmers are not only facing issues with harvesting but storage of grains is also a challenge since farmers are still using these traditional storage methods and often losses are high due to pest damage. Climate and locally available resources influence the choice of storage methods in any given ethnic farming community (Kiruba *et al*, 2006).

Common grain storage methods include storing grains such as maize in containers made of shrub sticks and often plastered with cow-dung or mud. For grain cereals such as millet, sorghum and maize, often farmers hang sheaves above the fire place inside the house in order to prevent pests using smoke or store grains on roof tops (Chimbidzani, 2006; Hunduma, 2006; Kiruba *et al*, 2006; Kuye *et al*, 2006). Though losses may be deemed high, farmers continue to use these storage methods since labour inputs in constructing them are not high and some do not even need construction (Kirubal *et al*, 2006).

In India traditional storage methods for grains include *mankatti* (mud house), *kulukkai* (earthen bin), *addukkupaanai* (earthen pot like structure) and *pathayam* (wooden bin). These traditional storage methods were tested and found to be successful in storing

various grains and normally farmers will top up these structures with dried leaves of *P. pinnata* and *A. indica* to protect crops from storage pests (Kiruba *et al*, 2006).

A similar study in South Africa was conducted by Thamaga-Chitja *et al* (2004) and it was found that farmers store grains, particularly maize in *inqolobane* (silo), a mud and twig house built near the household. Some farmers would also store maize cobs by hanging above the fire place. Similar practices were also followed in Ethiopia where farmers hang sorghum, maize and millet above fireplace and the smoke serves to protect grains from pests (Hunduma, 2006).

To control these pests during storage, farmers use concoctions of ash and store beans mixed with such concoctions. In some instances, farmers will mix ash with water to form a paste which will then be added to the beans; other farmers mix legumes with ground black pepper and expose legume seeds to sunlight for a certain period of time (Akollo *et al*, 2006). To test the effectiveness and sustainability of the indigenous bruchid beetle control methods, a study conducted by Songa and Rono (1998) using wood ash, corn oil, sunning and sieving methods was conducted in Kenya. The study found that the commonly wood ash method was effective in controlling the beetles but corn oil was more effective so was sunning and sieving. Other methods of controlling bean storage pests include the use of citrus peel powder and this method was found to be effective especially in controlling bean weevils (Allotey and Oyewo, 2004).

2.3.5 Subsistence orientation

The average size of agricultural land in traditional farming system is less than two hectares in the majority of developing countries (Ongwen and Wright, 2007). On the other hand, agriculture is mainly rain fed and seasonal, since the majority of traditional farmers are poor and cannot afford formal irrigation systems like in developed countries. In southern Africa the majority of food production is during rainy season ((Brookfield *et al,* 2002; Kaihura and Stocking 2003; van Huis and Meerman, 1997). One of the biggest challenges in traditional agriculture is land productivity. Production is not only dependent on who cultivates the land but also on what technologies, social and economic resources are available to farmers.

Farming activities are carried out around homesteads and production is mainly for home consumption with surpluses sold to local markets or communities, thus contributing to local economies (Chimbidzani, 2006; Hunduma, 2006; Abate *et al*, 2000). In a study conducted by Cornia (1985) on agricultural productivity for 15 developing countries, it was found that productivity of small-holder farmers was two to ten times higher than those of larger farms. The same results were found by Banerjee (1985) in West Bengal and in India through a FAO study conducted by Singh *et al* (2002). Though farms were small, local and family labour was used, total output was high. What is demonstrated by these studies contradicts the view that traditional farmers are mainly farming for subsistence but also contributes to local economies. These studies also show that small plots do not always limit traditional farmers from producing considerable yields. Despite the small plot around households that traditional farmers use, production is diversified since farmers have developed cropping patterns that allow optimal usage of space and time.

Although farming from small plots around homestead is the main feature of land use systems in traditional agriculture, there are however some exceptions where shifting cultivation is still widely practiced. Small pieces of land are limited to those farmers where land availability is an issue but for those farmers where there is plenty of available land, there are other forms of land use such as shifting cultivation. *Chiteme* farming practice in Zambia is a type of such shifting cultivation that is still widely practiced (FAO, 2004; Davies, 2000). Other countries where the practice is still followed include Mexico, this indicating that fixed small land size is not a uniform feature for all traditional farmers throughout the world.

2.4 Efficiency of Traditional Agriculture

Great emphasis on the features of traditional agriculture and practices followed by farmers to ensure production will not necessarily reflect efficiency of this farming system unless certain indicators of efficiency are considered.

In many developing countries, the introduction of improved varieties, modern technologies and attempts to change traditional agricultural systems from subsistence

to a commercial orientation, have largely undermined the efficiency of traditional agriculture. It is seldom anticipated that production under traditional agriculture can be successfully achieved using indigenous low energy methods, local crops and indigenous understanding of the ecology. Efficiency of traditional agriculture can be viewed from four features; sustainability, equity, stability and productivity (Stone *et al*, 1990; Altieri, 1987). Each of these features has different properties that determine how well the farming system functions.

2.4.1 Sustainability

Traditional farmers through their contributions of labour and environmental considerations have ensured sustainable production each cropping season. Briefly, sustainability is viewed as the ability of an agricultural system to maintain production over time, in the face of challenges such as ecological constraints and socio-economic pressures. Traditional farmers with their dependence on internal or locally available resources and dependence on family labour have ensured production enough to sustain their livelihoods. (Altieri, 1987).

In a study conducted by Pretty *et al*, (2005) with 286 farm projects in 57 developing countries, it was found that poor farmers are increased their yields by at least 79% using sustainable locally available resources. This study shows that traditional agriculture is sustainable since production levels are being maintained or even increasing over time. Bearing in mind that traditional farmers are mainly small holder farmers, their productivity has continued to be sustainable despite the criticism that their production systems are primitive and unproductive (Ongwen and Wright, 2007).

2.4.2 Productivity

Diverse outputs are produced from traditional agricultural systems since most of the land is used to produce diverse ranges of crops. Literature abounds with indications that traditional farming systems are productive with higher output per unit of land when compared to some commercial farming systems (Ongwen and Wright, 2007; Raghbendra *et al*, 2000; Heltberg, 1998; Cornia, 1985). In the USA it was found that small-holder farmers of about four acres have over 100% higher outputs in dollars per

acre as compared to large farms using all the possible modern technologies. It is equally important to consider the contribution of these high returns and output towards the development of the producers.

2.4.3 Equity

Equity in traditional agriculture is concerned with the evenly distribution of products among local producers and the beneficiaries (Altieri, 1987). The contribution of traditional agriculture cannot be understood outside the context of rural communities because this is where the practice is prevalent and where the majority of the poor worldwide reside (Sen, 1999). With the goals of MDGs being to eradicate poverty and hunger, it will not make sense to have high production that is not evenly distributed within the communities who are the main producers and yet leave them to die of hunger and poverty (Ongwen and Wright, 2007). Though production through traditional methods is mainly directed at sustaining the household, traditional farmers have strong social relations in the sense that production is shared with neighbours and communities that cannot afford to produce their own crops (Ongwen and Wright, 2007).

2.4.4 Stability

In the majority of developing countries, traditional farmers are faced with challenges of adverse environmental pressures such as the weather. As a result of this, the possibility of losing crops to pests and diseases is high. However, farmers have ways of facing such challenges by adopting cropping patterns, using locally available resources and local seed varieties suitable for the presenting environment. In a study conducted in China, it was found that rice yields grown under traditional agriculture produced 18% more yield per hectare without the use of any agrochemicals than, yields of rice with the use of agrochemicals that were plagued by fungi (Monbiot, 2000). This study is just an illustration of the stability of traditional agriculture despite the harsh environment farmers' face. The stability of traditional agriculture is more established in mixed cropping systems and use locally available resources such as manure and compost.

Though farmers are facing different challenges in an attempt to sustain their production system, it is important to recognise their efforts and support their system since they contribute largely to the food security and economies of developing countries.

2.5 Empirical studies conducted with traditional farming systems

Throughout the world there is a rising concern on ways of sustaining the environment; this concern has hus contributed to finding ways of using sustainable agricultural methods. Several studies have been conducted pertaining to traditional agricultural systems throughout the world. Seven studies were reviewed; Bangladesh, two studies from Ethiopia, Philippines, Botswana, Zimbabwe and South Africa so as to have a view on the position of traditional agriculture.

2.5.1 Patterns and determinants of agricultural systems in the Chittagong Hill tracts of Bangladesh

Thapa and Rasul (2005) conducted a survey in Chittagong Hill tracts of Bangladesh. The purpose of the study was to investigate the patterns and determinants of agricultural systems in this area. Data was collected from 36 villages of Bandarban Sadar and Alikadam sub-districts of Bandarban district. Surveys conducted at village and household level to collect data used semi-structured interviews, observations, focus group discussions and key informant interviews. The study found that there were three agricultural systems are practiced by farmers in different areas. Institutional support, productive resources and distance to the market were found to be major determinants of the three farming systems investigated.

2.5.2 Local crop genetic resource utilization and management in Gindeberet, west central Ethiopia

Hunduma (2006) conducted a household survey in Ethiopia to understand farmers' traditional knowledge and practices in the conservation of crop genetic resources. The study was conducted in Gindeberet district west central Ethiopia. One hundred and eighteen households heads from 90 small-holder farmers and seven key informants were selected for the study. The household survey was conducted using semi-structured interviews, group discussions held with key informants and direct field

observations were made. The study found that the majority of farmers still follow traditional farming practices such as intercropping and crop rotation. It was also found that farmers prefer local varieties in crops such as maize, sorghum and wheat. One of the major findings was that the majority of farmers especially the poor (67%), do not have enough land thus are not able to produce enough crops and are forced to ask for seed from others. The study found that farmers use their own seed, thus genetic diversity is conserved.

2.5.3 Local sean seed system

Mekbib (1999) conducted a survey in Eastern Ethiopia to study the local bean seed system. Some (176) farmers participated in the study and it was found that farmers, especially poor farmers rarely buy seeds but rather produce their own seeds. The study also found that good seeds selection was based on characteristics such as growth, performance, size, shape and colour. Farmers in the study also indicated that the local seed system is cheap and accessible to all farmers. All seeds are produced, controlled and processed based on indigenous knowledge. The study was able to have clear understanding of characteristics of local seed systems operate.

2.5.4 Indigenous knowledge systems and the conservation of small grains seeds: A case of Sangwe communal lands of Chiredzi in Zimbabwe

Chigora, Dzinavatonga and Mutenheri (2007) conducted a study in Sangwe district in Zimbabwe to assess the situation of small grain seed systems. The study found that the majority of farmers produce their own seeds and that seed selection is done at the homestead mainly because plants look very similar in the fields. Selected seeds are stored separate from the grain, either in sealed bottles or tins, clay pots and hanging in unthreshed panicles above the fireplace.

2.5.5 Gender differentiation among farmers in the agricultural sector in Benguet, Philippines

Lu (2007) conducted a study in Benquet, Phillipines to assess gender division among vegetable growers. The study was conducted among 39 farmers and individual interviews held. The study showed that men were assigned to labour intensive tasks such as land preparation while women were found to perform less labour intensive tasks such as planting and weeding. However the study also found that agriculture was dominated by males; thus major farming decisions were made by males. Moreover, it was also found that hired labour was important since responsible for all labour intensive activities such as ploughing, sowing, transplanting, weeding and harvesting and the majority of hired labour were males.

2.5.6 Farmers' perceptions of socio-economic constraints and coping strategies in crop production in Mopipi, Botswana.

Chimbidzani (2006) conducted a household survey in Mopipi district central of Botswana. The purpose of the study was to describe existing farming systems with an emphasis on socio-economic factors such as causes of declining productivity. The study area has two main wards which were used as units for sampling. Thirty households were selected from each ward resulting in a sample of 60 households. Data were collected using both structured and semi-structured questionnaires during interviews with the households. Additional data were collected during field work through observations, with village elders and some key informants.

The study found that intercropping was the main cropping system in the study area and that intercrops included maize, sorghum, melons and beans. Constraints to production in the area of study were found to be shortages of labour, capital, employment, and market constraints. Lack of capital was perceived by farmers as the biggest (53.7%) cause of low agricultural production since farmers are unable to access external inputs such as machinery and fertilizers. The general finding of the study was that it is possible that people when facing serious challenges undermine ecological issues in order to survive.

2.5.7 What do subsistence farmers know about indigenous crops and organic farming? A preliminary experience in KwaZulu-Natal

Modi (2003) conducted a survey among small-scale farmers in with the objective of assessing the state of knowledge regarding indigenous crops and organic farming.

Many (123) farmers were interviewed using a questionnaire. The study found that farmers do not know much about the origins of crops but that farmers were knowledgeable about indigenous crop production systems. It was also found that farmers associated organic farming with poverty, subsistence farming and cultural norms. The study found that farmers associated indigenous crops with low social status such as poverty, race and subsistence. It was also found that farmers do not attach much importance to the origins of crops cultivated.

2.6 Features of modern agriculture

Modern farmers follow mono-cropping, rely on chemical fertilisers, high yielding seed varieties, mechanised farming implements and hired labour. Production is purely for a commercial basis. Modern farming systems started with monocropping and later chemical fertilisers were incorporated into the system (Shiva, 1995). In Tanzania modern maize farmers apply different chemical fertilisers to maintain high yields though the use of fertilisers is constrained by high prices and inappropriate knowledge of applications (Kaliba *et al*, 1998).

Summary

At the philosophical level, researchers and scientist in some fields seem to agree that there is a farming system known as traditional agriculture and that this system is the mainstay of many economies in developing countries. While there is this recognition, it is clear that traditional agriculture is mainly defined in the context of rural farmers who produce food crops with subsistence orientation, from small plots using locally available resources. Indigenous knowledge plays an important role in agriculture as this knowledge is passed from generation to generation thus contributing to the sustainability of this mode of food production.

Literature on features of traditional agriculture is full of contradiction. It is seeing it a primitive, low external input, unproductive system that need to be transformed, while on the other hand is seen as an efficient and productive system that needs to be recognised. The problem lies in the failure to see traditional agriculture as a collection of systems that is not to be contrasted with modern agriculture since the two systems operate from totally different production factors and needs.

From the literature traditional agriculture is defined by feaures such as agro-ecological methods where farming methods followed by farmers mimic ecological processes and include land preparation methods, multiple cropping patterns and use of local varieties of seed.

Indigenous knowledge plays a major role in traditional farming especially in crop protection and soil fertility management. Traditional crop protection practices are embedded on indigenous agricultural knowledge passed from generation to generation among household members and farmers. In addition to this, farmers maintain their soils using locally available resources such as kraal manure.

Despite reliance on indigenous knowledge for crop protection and soil management, literature points that traditional farming implements are still in use and these include hand hoes and animal traction. The prevalence of traditional implements is influenced by costly demands of mechanised implements and lack of operating skills among farmers. Household members play an important role as a pool of labour for farming activities. From literature, women play a bigger role in traditional crop production as main actors in farming activities.

A subsistence orientation was also found to be the major objective for farming among traditional farmers although surpluses were sold for income generation. Commonly grown crops among traditional farmers include; cereals, legumes and tubers.

From literature the factors that deemed important in traditional agriculture include techniques of land preparation, cropping patterns, soil fertility maintenance, harvest storage, seed selection and management.
The next chapter will present area of study and sample characteristics. This will include geographic and agricultural characteristics of the study area and the overall characteristics of the sample.

CHAPTER THREE: AREA OF STUDY AND SAMPLE CHARACTERISTICS

3.0 Introduction

The study was conducted at Embo within the Mkhambathini local municipality, in KwaZulu-Natal province. Embo is one of the rural areas where the majority of people are engaged in farming activities around homesteads though some farmers have fields near or far from their homestead. Previous research done at Embo was among members of the Ezemvelo Farmers' Organisation (EFO), based on capacitating farmers for increased crop production and commercialising their traditional crops. The farming community of Embo is also involved in the South African-Netherlands project on Alternative Development (SANPAD) which is aimed at helping farmers to realise the value of their indigenous knowledge and how this can contribute to expanding and improving their farming practices and increase production of their indigenous crops. The selection of Embo was based on the premise that extending research on farming methods found in the area will contribute to a deepening of knowledge that enriches other research projects being conducted in the area to the benefit of the farmers.

3.1 Mkhambathini local municipality

Mkhambathini local municipality lies between Ethekwini metropolitan and Pietermaritzburg (Mkhambathini local municipality Integrated Development Plan (IDP), 2003/2004). There are six tribal authorities within Mkhambathini municipality being KwaNyathi, Embothimoni, Calagwayi, Isimahla, Vumukwenze and Maqonqo. The area Embo, where the study was conducted, falls under the Embotumini tribal authority. See figure 3.1.

3.1.1 Population

Population of Mkhambathini municipality is estimated at 59067 individuals in 12551 households. The majority of the people live in rural areas under traditional authorities (Mkhambathini Municipality IDP, 2006/2007; 2000).

3.1.2 Topography

Mkhabathini municipality is mainly characterised by undulating escarpments and steep slopes. Land use pattern depicts the apartheid past since fertile soils and gentle sloping above escarpments are covered by commercial farms mainly owned by white farmers, while the traditional authority areas are mainly located below the escarpment on the northern part of the municipality area (Mkhambathini Municipality IDP, 2006/2007).

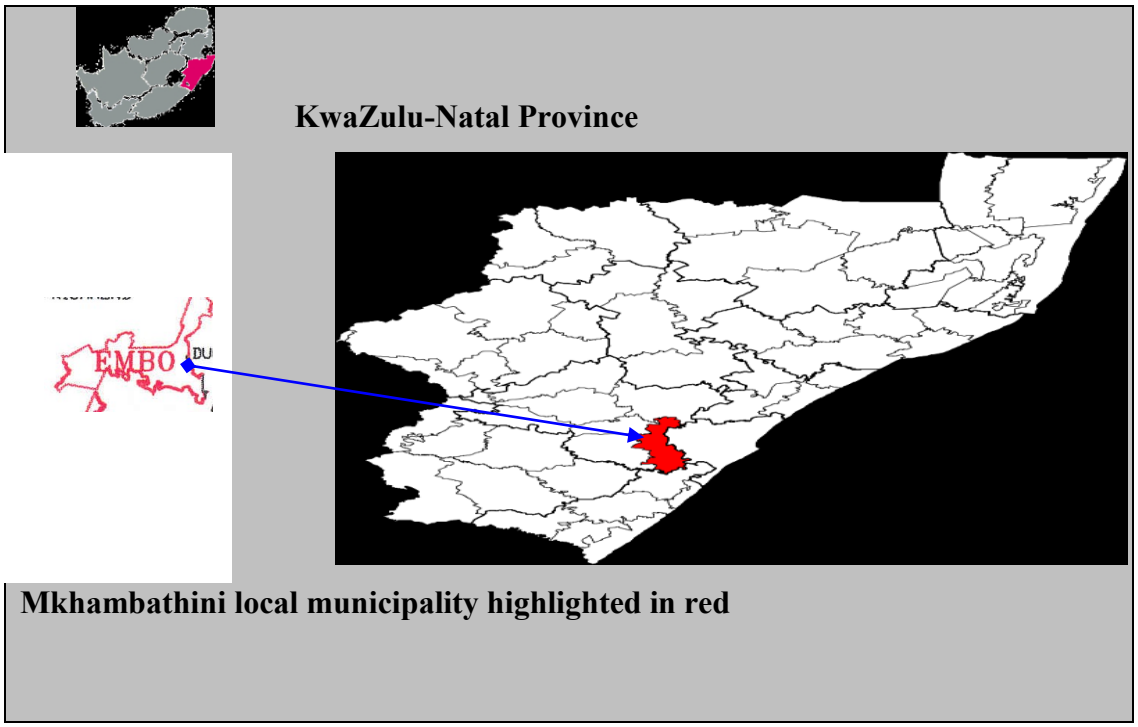

Figure 3.1 KwaZulu-Natal map showing Mkhambathini local municipality and Embo Source: Embo Rural Development Framework: 1998; Mkhambathini Local Municipality Integrated Development Plan, 2003/2004.

3.1.3 Climate

The area is characterised by humid temperatures with wet summer seasons and dry winters. The Embo area falls within wards 5, 6 and 7 of Mkhambathini Local municipality which receive a great share of rainfall on annual basis, thus ensuring that the area has great potential for agricultural activities (Mkhambathini Municipality IDP, 2006/2007).

3.1.4 Agriculture

Agricultural activities within this municipality are characterised by apartheid based inequalities, manifested in the dichotomy between the well developed white owned

farms while the underdeveloped and resource poor farmers are in wards 1, 2, 5, 6 and 7. The majority of farmers in these areas are small scale or subsistence farmers and do not fully farm as commercial farmers (Mkhambathini Municipality IDP, 2006/2007).

3.2 General information about Embo

The Embo area is governed by two political systems; traditional and municipal and is made up of five traditional authorities. The five tribal authorities comprise local traditional structures that include Amakhosi, Izinduna, and traditional councillors; those appointed by the induna or chief. The five traditional authorities are Embo, Embo-Kwakhabazela, Embo-Nksh isiMahla, Embo-Timuni and Embo-Vumakwenza and falls under Mkhambathini local municipality area (S.A Explorer, 2001).

There is very little infrastructural development present; a tarred main road through the area and a few minor trading stores. A few areas have standpipe water and electricity but most have neither.

3.3 Background to Ezemvelo Farmers Organization (EFO)

Ezemvelo Farmers' Organisation (EFO) is a group of small scale farmers which started in 2001 at Ogagwini near Umbumbulu. EFO was started by Dr Albert Modi in 2001 with the aim of helping farmers to market their organic crops like amadumbe (Vikela, 2003). EFO members are mainly women (70%) and come from seven small neighbourhoods of Umbumbulu district.

The group started with 20 farmers in 2001 and had about 200 members at the time of the study. These farmers produce their food crops based on extensive indigenous agricultural knowledge; thus they do not apply any external inputs like chemical fertilisers (Fischer 2005). This way of farming has made them recognised as organic farmers in the area.

Farmers have their fields around their homesteads and also own land from half a hectare to five hectares though this is not applicable to everyone, those who want to expand their land can rent or ask land from neighbours who are not using the land for any agricultural activities. Alternatively access to land is allocated by the chief and

people have access to occupy such land as long as they want to pursue a living from farming (Fourie and Hillermann 2001).

Most of the farms are on steep slopes making farming difficult and farmers are sometimes only able to cultivate their lands manually due to these steep slopes. Farmers are able to adjust their farm boundaries and this decision is mainly determined by the importance of the crop to be planted, quantity of seeds available (Mkhambathini Municipality IDP 2006/2006; Fischer 2005).

Farmers produce traditional crops like amadumbe (taro), beans, pumpkins, maize and other traditional food crops (Fisher, 2005; Modi, 2003). Amadumbe is now regarded as a cash crop but is still widely consumed in the area. EFO's amadumbe organic produce is supplied to large food chain supermarkets like Woolworth through a commercial packhouse. Although farmers have been successful in marketing their produce they also face some challenges that limit their full success in organic farming. Farmers have insufficient information about organic production, lack of appropriate tools and storage facilities for their produce within the local area (Cudmore, 2006).

The most dominant commercial farming activity in the area is cultivation of sugar cane mainly by white farmers; however, there is the emergence of small scale African farmers who also cultivate sugar cane. The number of small-scale sugar cane farmers started increasing from 1990 after land previously belonging to sugar cane companies was sold to African farmers (Agergaard and Birch-Thomsen, 2006)

The majority of the members of EFO are women and sometimes are relatives, thus farming activities are carried out based on family labour. Women are responsible for cultivating their plots, weeding and harvesting their crops. Thus crops grown are generally regarded as women crops (Fischer, 2005).

The next chapter gives a detailed description of methodology of the study and how the sample described in this chapter was selected and how data was collected and analyzed.

CHAPTER FOUR: METHODOLOGY

4.0 Introduction

While it is assumed that rural communities in KwaZulu-Natal, including the community under study, are in one way or another, still practitioners of traditional agriculture, this study was considered significant since there are limited studies conducted to understand what is seen as traditional agriculture and its importance to farming communities. This poses a challenge to the farmers since in most cases their farming practices are often misunderstood, thus considered backward and unproductive. This misconception has led to neglect by the government and development agencies directing most attention to commercial farming (Manona, 2005). This study was thus undertaken to fill this gap and to shed light to those interested in developing agricultural production in rural areas based on what the farmers reported.

4.1 Research design

The study was conducted at Embo among Ezemvelo Farmers' Organization (EFO) farmers in KwaZulu-Natal. The study was conducted to understand the farming systems in this rural area and how decisions are made to make the systems sustainable. The investigation was conducted by a research team comprising of four post-graduate students from the University of KwaZulu-Natal all participating in the SANPAD project. The other projects (besides this one) related to *in situ* field trials of crops for improved soil fertility, market influences on farming decisions and relationships between homestead farming and community gardening. This study offers a baseline description to inform the others about traditional farming protocols in the area.

A research design is defined as a plan or structured frame work of how one intends to conduct the research process in order to solve the research problem (Babbie and Mouton 2001:104). A qualitative approach was used for this study to gather information through participant observations; semi structured face-to-face interviews and focus group discussions.

A qualitative approach was used for the study because assumptions of qualitative designs are that qualitative researchers are interested in researching people in their natural settings, emphasising interpretations and meanings and achieving a deeper understanding of the respondent's world (Klein and Myers, 1999; Sarantakos, 1998). Despite numerous disadvantages levelled against qualitative research, the biggest problem is that data collected through qualitative methods are very difficult to generalise to the entire population and also samples do not necessarily represent the population (Sarantakos, 1998).

4.2 Sampling

Sampling is an important aspect of enquiry because it allows the researcher to make judgements about various aspects on the basis of fragmentary evidence regardless of the research strategy or investigatory technique used (Robson, 2002). The purpose of sampling is to make generalisations about the whole population which are valid and which allow prediction (Babbie and Mouton, 2001). For the purpose of this study generalisations can only be made to the sample itself since purposive and convenient sampling procedures were followed.

4.2.1 Sampling procedure of the study.

- **Population**

Target population can be referred to as the population being studied or the population of interest to the research from which the sample will be drawn (Sapsford and Jupp, 1996). The target population of the study was all EFO farmers that have farms around homesteads in Embo. Since Embo is a very big area the population was narrowed down to only farmers who reside in Ugagwini (oluphezulu and oluphansi), Ezigeni, KaMahleka, KaMsholosi and KaHwayi sections. EFO farmers were chosen as the target population because the main objective of the study was to understand farming practices followed by this group. Also, EFO farmers were chosen since the researcher had access to and farmers were participants in the SANPAD project of which the researcher was part. EFO has membership of about 200 farmers in these six sections in Embo.

In this study, selecting the area, and identifying key informants in each of the six sections were through the help of one of the researchers who had worked with the farmers before. Face to face interviews were held with individual farmers which were followed by focus group discussions in all the six sections using predominantly qualitative methods.

- **Sampling procedures**

Sampling in qualitative research takes non-probability approach. The researcher has no guarantee or cannot predict that each element in the population will be represented and that other members of the population have little or no chance of being sampled.(Leedy and Ormrod, 2005). For the purpose of this study two types of non-probability sampling were used.

- **Purposive sampling**

Purposive sampling involves choosing the population of the study for a particular purpose and selected on the premise that they can provide rich information pertaining to the study and from which to learn certain patterns within a particular group (Sarantakos, 1998). A purposive sample is thus a sample that has been selected because it has special characteristics and is representative of the target population (Fink, 1995). The process of sampling following this method involved identifying informants and arranging times of meetings. In each of the six areas sampled, a key informant i.e. the lead farmer was identified, contacted and met so as to make arrangements for meeting other farmers from that area.

EFO farmers were purposely sampled because the researcher's interest was to understand farming methods among this group of farmers but not all the farmers in Embo. The reason for this is that the group's number is manageable and if all the farmers were to be surveyed in Embo the cost of the survey would be beyond the resources of the researcher. The criteria for selection included that EFO farmers are certified organic a*madumbe* farmers, and where farming activities were mostly around homesteads and used family labour to carry out farming activities.

- **Convenience sampling**

Convenient sampling was used since only farmers that were readily available when needed formed part of the study. For each of the six sections, a key informant in each

section was the one who organised all the other farmers. As a result a total of 65 farmers were selected based on this method. With this method all units/elements for the study that the researcher comes across are considered (Sarantakos, 1998; Fink, 1995). The farmers were ready to meet the researcher; thus they availed themselves for all the meetings arranged with them. All farmers who participated in the study were considered to give reliable information pertaining to the study since they are all EFO members.

4.3 Data collection process

Data was collected through a survey using participant observations, semi structured face-to-face interviews and focus group discussions and such a combination of methods is called triangulation. In this study intra-method triangulation was used since all the three methods used are qualitative methods (Leedy and Ormord, 2005). Triangulation was used to obtain a variety of information on the same issue, to achieve a higher degree of validity and reliability and so as to overcome the deficiencies of single-method study. Moreover, triangulation was used so that strengths of one method can overcome the deficiencies of the other method (de Vos, 1998; Sarantakos, 1998).

The survey started in February 2007 and ended in September 2007 when all data was collected. Between the months of February and May, six farmers, one in each section were repeatedly visited. It was during this time that participant observations were made.

Conducting a survey throughout the study area was needed to reach the target population based on the characteristics of traditional farming. In most cases information collected in a survey is about people's knowledge, practices and attitudes and the use of a survey is more important when the information needed by the researcher is gathered from the people under study rather relying on second hand information (Taylor-Powell and Hermann, 2000).

4.3.1 Participant observations

This is one of the methods used in social and qualitative research where the researcher collects information through interactions and is involved with the participants over a longer period of time in activities relevant to the study. Primary data collected by this

method are unstructured since narrative descriptions from observations are casual or informal conversations with the participants (de Vos, 1998; Sarantakos, 1998).

- **Structure and processes**

Participatory observations were conducted from February until end April and continued during July to September. During the first part of the observations, ten farmers were visited at their homesteads and were briefed about the purpose of the visit. In all the visits to the ten farmers' homesteads, farmers were found busy with farming activities. Researchers would join them while having conversations that can be termed unstructured interviews, no questionnaire was used. Field notes were taken and pictures, with farmer permission. See figure 4.1.

Figure 4.1 Researchers in farm activities during visits

The duration of the visits to the ten households differed from one household to the other, depending on what the farmer was doing on that day. However, farmers always welcomed researchers and the relationships between the researchers and the farmers were built at each visit to the farmers' households. The initial time-frame for visits to various households was a maximum of one hour per household. This was done to allow time for conversations with the farmer, asking questions relevant to the study. Conversations were in Zulu since all the farmers are Zulu speakers, all notes taken during this time were in English. The use of Zulu language during the visits was important for the study since at times participants did not feel comfortable when speaking a foreign language. Speaking in a foreign language could have limited the

quality of information that could be communicated between the researcher and the participant (Creswell, 1998)

In each homestead that was visited, observations made by the researcher included the crops that were cultivated, cropping patterns, farming implements used and who was responsible for carrying out the farm activities, and where farming information was obtained. From each visit that was done during the period February to April, the activities were different from what was observed previously since farming is a process. Activities differed also varied from household to household. In some households, observed activities were planting, while in other households, farmers were preparing land for other crops while still others were weeding. See figure 4.1. Towards the end of April farmers were busy harvesting *amadumbe.* Being such a busy period, observations were stopped to allow farmers to carry out their work uninterrupted. During all the period of participatory observations, farmers were not informed that researchers were coming; this was done to find farmers in their natural setting. The last observations were done in July just before interviews were collected in August. Observations made at the time of the study included land use during winter, crops that were available, soil maintenance practices. Conversations were held and questions were asked.

4.3.2 Interviews

In qualitative studies interviews are basically semi-structured and open. Open-ended and closed ended questions are used, they are predominately single interviews, questioning one person at a time (Sarantakos, 1998). There are different types of interviews but for the purpose of this study face-to-face semi-structured interviews were employed. Face-to-face interviews involve the researcher and the participant with the use of a questionnaire. The same questionnaire is administered to all the participants in the same order (Creswell 1998; Sarantakos, 1998; Sapsford and Jupp, 1996).

- **Structure and process of interviews**

Face-to-face interviews were conducted with ten groups of farmers from each of the six sections in Embo from August to first week of September 2007. An interview schedule was administered by three researchers, one farmer at a time. The same

interview schedule was used for all the farmers that were interviewed, in the same question order. The interviews were all conducted in Zulu with the interview schedule translated into Zulu.

Through the help of the informants, farmers were organised and all gathered at one place for each section. Before the interviews started, researchers introduced themselves to the farmers, and the purpose of the interviews was also discussed with the farmers.

Setting of interviews

The first set of interviews was conducted with ten farmers at a community garden in Ogagwini Oluphansi section. Each of the three researchers conducted an interview with one farmer at a separate spot in the field. See figure 4.2.

Figure 4.2 Face-to-face interviews

An interview with one farmer lasted for 30-40 minutes depending on how fast the researcher was in noting responses and how the interviewee responded to the questions. The second set of interviews was conducted at Ogagwini Oluphezulu at the informant's house with eleven farmers. The researchers with their interviewees sought spots within the yard to conduct the interviews. The same procedures were followed as with the first group. The third set of interviews was conducted at Ezigeni with nine farmers at the informant's place. Three researchers were available for these

interviews. Researchers had to find spots within the yard that were comfortable for both the researcher and the interviewee so as to conduct the interviews. The same procedures were followed for the other interviews. The fourth set of interview was conducted at KaMahleka with ten farmers and was conducted at the informant's place and only two researchers were available this time. Here interviews were very difficult since the weather was bad. It was very windy, thus interviews could not be held outside. The interviews were conducted inside the house in the same rondavel but at different sides. The fifth interviews were conducted at KaMsholozi with ten farmers at the informant's place. Three researchers were available and all were responsible for conducting the interviews. Interviews were conducted outside since the weather conditions were conducive enough to do that. All procedures followed in previous interviews were also followed. The duration of the interviews was the same as of those conducted outside. The last set of interviews was conducted at KaHwayi with fifteen farmers and two researchers at the informant's place inside the house. The weather was not conducive again, since it was raining. The interviews duration was approximately the same as when conducted outside.

At the end of each of the six sets of interviews, lunch was provided by the principal researcher and the whole team ate together, farmers and researchers. With all the farmers in each group after lunch, focus group discussions started.

4.3.3 Focus group discussions

Focus group discussions were conducted after the face-to face interviews. Conducting focus group discussions was deemed necessary since interaction among participant would be more informative than individually conducted interviews (Leedy and Ormond 2005). In a focus group, the discussion that is taking place is limited to the specific theme under investigation, thus a focus group discussion can be referred to as a purposive discussion of a specific topic or related topic to the study taking place between eight to twelve individuals with similar background or common interest (de Vos, 2000; Sarantakos, 1998). Each participant in the group is allowed to make a comment about the topic or ask questions, and individual comments are respected. It is also important for the researcher to probe in order to gain an understanding of the most critical issue during the discussion (de Vos 2000; Sarantakos, 1998). For the

purpose of this study the following structure and processes were followed during focus group discussions.

- **Structure and processes of focus group discussion**

After the interviews, focus group discussions were held, one in each area in Embo. Each focus group consisted of farmers who had participated in the interviews. The main objective of conducting these interviews was to get more information about specific issues in the study. Discussion processes were guided by a discussion guide translated in Zulu and was identical for all the six groups. For each discussion, one researcher was a leader while the other three were recording responses and observing the process. All the six focus groups were conducted along similar lines.

- **Setting of focus groups**

The first focus group discussion was conducted in the community garden with all the farmers who participated in the face-to-face interviews and four researchers. See figure 4.3. The second focus group discussion was conducted at the informant's house inside the house with all the farmers who were involved in face-to-face interviews and two researchers. All the procedures followed for the first discussion were followed. The third focus group discussion was conducted with ten farmers at the informant's house and three researchers. The fourth discussion was conducted at the informant's house with all the farmers and three researchers. The fifth discussions were conducted by three researchers and the farmers who participated in interviews. The sixth discussion was conducted by two researchers with all the farmers in the remaining area. Of importance from this group is that one farmer was their secretary while was participating in the discussions the farmer was also recording everything that was discussed. The discussion from this group lasted longer than the discussions in other areas. Farmers were very participative asked questions of both researchers and among themselves. The discussion lasted for an hour and half compared to the others lasting for approximately 45 minutes to one hour due to the greater number of farmers from this section compared to other sections.

Figure 4.3 Focus group discussions

At the end of each focus group discussions farmers were thanked and also informed that researchers would come back to them concerning the findings of the study. For each the data collection methods discussed above, instruments used for each had a different structure and design. See Appendix A.

4.4 Instrumentation

Data collection does not only involve the methods but most importantly the instruments used to collect such data following some methods. Different techniques were used for this study. For the participatory observations field notes, interviews a questionnaire and a discussion guide for the group discussions were used.

4.4.1 Field notes

During participatory observations taking field notes was the main technique used to record data. Recorded data were the physical observations made by the researcher as well as the narrative descriptions from the conversations with the farmers. Field notes can be described as data about what activities occurred, where the activities were, who were involved in the activities and which procedures were employed to construct the notes (de Vos, 1998: 285). During participatory observation, a notebook was kept by the researcher, all activities and information related to the study with all ten farms where observations were initially done were recorded. The place, date and name of the farmer spoken to were recorded. Notes were taken while participating and

conversing with the farmer. The notes do not have any particular structure or design except those described above. See Appendix B4.

4.4.2 Interview guide

An interview guide was used during the face-to-face interviews. See Appendix B1and 2. This is a standardised form of asking questions. A standardised interview guide should contain same questions asked of all the respondents, can also have both open-ended and closed-ended questions. Questions must be structured in such away that the interviewee will be able to understand the questions (Sapsford and Jupp, 1996).

During interviews, the same guide was used for all the respondents with same questions in the same format. The schedule had open-ended questions which were used to permit free responses (Powell, 1997). Each guide had a space enough to record the responses. Closed-ended question were mainly factual questions where respondents were to choose from a range of given options.

Design of the interview guide

The design and structure of the interview guide was mainly guided by the objective of the study and sub-problems. The objective of the study was to understand what is and who practices traditional agriculture. The study has three research sub-problems:

Sub-problem one: What is understood as traditional agriculture? How is knowledge about this practice acquired and transferred to household members?

Sub-problem two: What influences farming practices that are followed?

Sub-problem three: What are the differences between traditional, modern and mixed farming classifications as reported by the farmers?

The interview guide was divided into two main parts: The first part of the schedule was about ecological factors of farming, which included questions about knowledge of farming, land distribution, farming implements, knowledge about plant protection, seed acquisition, harvest and post harvest processes to determine what farmers perceive to be traditional agriculture. The second part of the schedule included questions about dissemination of farming knowledge among household members, decisions about farming activities, decisions about crops to be cultivated and what the crops are produced for to determine farming classifications and the differences.

4.4.3 Discussion guide

For all focus group discussions, a discussion guide (Appendix B3) was used to record data. The original discussion guide was made up of open-ended questions only. For focus group discussions, one discussion guide was used by the facilitator for all the six focus group discussions; the respondents discussed the questions and agreed upon the response. The discussion guide was guided by the critical issues of the study. These were the description of farming practices as practiced by the farmer, what/who influences crops to be planted and knowledge about plant protection

4.5 Data analysis

Data analysis is an important part of any research and should be approached strategically since data analysis is conducted simultaneously with data collection. It is in the best interest of the researcher to have a plan on how to go about analysing data collected (de Vos, 1998). In this study both qualitative and quantitative data were analysed separately using different methods.

4.5.1 Qualitative data analysis

Qualitative data analysis is a reasoning strategy with the objective of taking a complex whole and resolving it into parts. Through analysis constant variables of factors that are relevant to the study are isolated (de Vos, 1998:338). Data analysis is concerned with the interpretation of data collected so as to draw conclusions that reflect the interest, ideas and theories that initiate the enquiry (Babbie and Mouton 2001: 101). Since qualitative data is in crude form, resolving data into parts allows the researcher to identify units that are of similar features and these are in turn coded. Once coding is complete the researcher can then carry out content analysis. For qualitative data in this study, content analysis approach was used because data were descriptive.

- **Content analysis**

In the context of qualitative research, content analysis investigates the thematic content of communication and aims to make inferences about individual or group values and ideologies as expressed in raw data (Sarantakos, 1998). Content analysis starts with the selection of categories. Phrases or sentences with similar meaning are

grouped together to form a category. Categories must be accurate, exhaustive and mutually exclusive and be clearly defined (de Vos, 1998). Responses were categorised according to similarities and a theme developed from all similar responses. From these themes, relationships and associations were identified to make sense of these relationships.

4.5.2 Quantitative data analysis

Quantitative data analysis includes all data analysis that has numerical values. Data analysis in quantitative research involved the use of statistics as a means of describing, analyzing, summarizing and interpreting data. The selection of statistical procedures is determined by the research design and type of data appropriate to answer the research question (Hittleman and Simmons 2002: 174). In this study, quantitative data came from all closed-ended questions from the interview schedule. Statistical Package for Social Scientists (SPSS) was used to analyse all quantitative data. This software was used to look for variations, correlations from different sample groups.

The next chapter will present the results, analyse, interpret and discuss the results of the study. Discussions of results will reflect on literature reviewed to show the relevance of the study in comparison with other studies conducted in similar contexts.

CHAPTER FIVE: RESULTS AND DISCUSSIONS OF RESULTS

5.0 Introduction

This chapter presents the results of the data collected for this study. The results and discussion of results are presented in relation to the research objectives and the sub-problems stated in Chapter one. The purpose of this study was to review farming practices followed by farmers in respect of food crop production and secondly to understand what influences the continual practice of such farming practices among rural farming communities of Embo. This chapter is divided into six main sections. The first section presents the demographic characteristics of farmers in the study area. The second section presents results from the classification of farming practices by farmers. The third section presents results on common cropping patterns, food crops produced and labour distribution. The fourth section presents results on soil management. The fifth section presents results on seed acquisition, harvest and post-harvest management. The last section then presents results on socio-economic factors that influences farming practices followed. Data presented in all the six sections are from participant observations, face-to-face interviews and focus group discussions.

5.1 Demographic data of respondents

The first part of the questionnaire for face-to-face interviews included items that required the respondents to provide some background information about themselves. Data collected from all the respondents included age, sex and membership of farming organisation. This was done in order to investigate if there are any differences in practices followed by farmers of different gender, age and affiliation to a farming organisation.

5.1.1 Farmers

The total number of farmers who participated in the survey was 65. Results show that only 14 (21.5%) were males, while 51 (78.5%) were females. With regard to EFO membership, 54 (83.1%) farmers belonged to EFO, while only 11(16.9%) did not belong to EFO. All 14 male farmers were EFO members, while from the 51 female farmers, 40 (78.4%) were EFO

members and 11 (21.6%) were non-EFO members. The results show sample is dominated by women and EFO members. See Figure 5.1.

Figure 5.1 Gender and EFO membership of farmers

This demographic background of the respondents was sufficiently varied taking into consideration that the sample was conveniently selected. Moreover discussing demographic particulars of the sample enhances the understanding and thus interpretation of results (Neuman, 1997). All respondents met the basic characteristics required for this study and could be relied upon to provide relevant and reliable information.

The 65 farmers were from six different areas in Embo, with each section having more than eight farmers and the highest area having fifteen farmers. Farmers were further grouped according to age group categories. See Table 5.1

Table 5.1 Age categories and distribution of farmers per area

Age categories (Years)	Ogagwini oluphansi		Ogagwini oluphezulu		KaMahleka		Msholosi		Ezigeni		KaHwayi	
	farmers	(%)	farmers	%	farmers	%	farmers	%	farmers	%	farmers	%
25-35	1	10	0	-	1	10	1	10	2	22.2	2	13,3
36-45	2	20	2	18.2	3	30	2	20	4	44.4	4	26.6
46-55	2	20	1	9.1	1	10	3	30	3	33.3	3	20.0
56-65	4	40	4	36.4	4	40	3	30	0	-	2	13.3
66-75	1	10	2	18.2	0	-	1	10	0	-	3	20.0
76-85	-	-	2	18.2	1	10	0		0	-	1	6.7
Total farmers	10	100	11	100	10	100	10	100	9	100	15	100

Farmers' ages were grouped into six categories; category 1(25-35), category 2(36-45), category 3(46-55), category 4(56-65), category 5(66-75) and category 6(76-85). Very few farmers fell in the youngest and the oldest categories with the majority of farmers being either between 36-45 years or between 56 and 65 years of age.

The variety in distribution of farmers throughout Embo is satisfactory in the sense that all areas were represented in order to avoid bias in the results. The age categories of respondents reflect that farmers there were old enough to have been thoroughly involved in farming activities thus have enough experience and give reliable information regarding farming practices that were followed. This view is supported by Babbie and Mouton (2001: 236), who stated that respondents should be competent and able to give answers reliably.

5.2 Farming classification by farmers

In this section, results include information on how farming knowledge is acquired, classification of farming practices, land use and labour distribution. To link this understanding with farming practices followed by farmers, three key questions were asked.

5.2.1 Farming knowledge acquisition methods

Questions based on how farming knowledge was acquired had multiple responses. Farmers when asked how farming knowledge is acquired, the majority 42 (64.12%) of farmers mentioned experience, 39 (60.00%) mentioned observation, while a few 8 (12.31%) and 11 (16.92%) of farmers mentioned training and other means. See Table 5.2.

Table 5.2 Farming knowledge acquisition methods (n=65)

Farming knowledge acquisition*		gender of farmer	
		Male (n=14)	Female (n=51)
knowledge observation	yes	11	28
knowledge thru experience	yes	9	33
knowledge thru training	yes	2	6
Total		14	51
Total	**65**		

*Multiple responses provided

These findings show that the majority of farmers have acquired their farming knowledge based on observation and experiences from what has been practiced before, thus farming knowledge has been passed to them. These results therefore correspond with what was found in literature. Kuye *et al* (2006); Maonga & Maharjan (2003) indicated that rich indigenous agricultural knowledge is passed on from generation to generation on how to identify soil good for food crop production, soil fertility management, planting methods and crop protection.

5.2.2 Farming classifications

Based on how farming knowledge is acquired, three farming classifications were mentioned by farmers. However, the majority (98.46%) of farmers classified their farming practice as traditional. Respectively, very few (7.69%) and (9.23%) of all the farmers interviewed saw their farming practices as mostly modern and mixed. The results thus indicate that the sample is dominated by traditional farmers. See Figure 5.2.

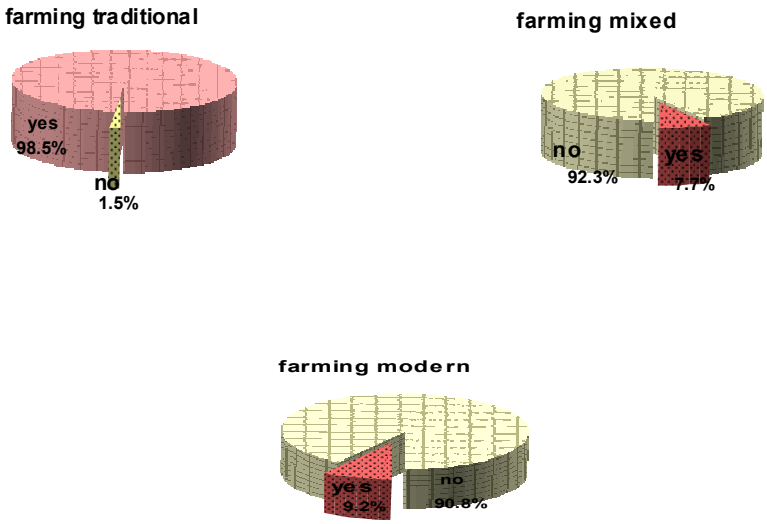

Figure 5.2 Farming classifications

Low percentages of farmers describing their farming as mostly mixed and modern could be related to factors such as external inputs and lack of financial support from the relevant stake holders such as Department of Agriculture and development agencies. Farming classification

as traditional was not influenced by gender since all (100%) of the female and (93.6%) of male farmers classified their farming as traditional. See Table 5.3.

Table 5.3 Farming classifications by gender (n=65)

		Gender of farmer		Total
Farming mostly traditional		**Male (n=14**	**Female (n=51)**	
	yes*	13	51	64
Total		14	51	65
Farming mostly modern		**Gender of farmer**		Total
		male	**female**	
	yes	2	4	6
Total		14	51	65
Farming mostly mixed		**Gender of farmer**		Total
		male	**female**	
	yes	1	4	5
Total		14	51	65
Chi square (p=.054) 2 cells (<50.0%)				

*Denotes multiple responses

Farmers' responses were from a choice of all the three farming classifications as a result multiple responses were observed. These results show a slight significant relation for females and farming mostly traditional. This finding is supported by what is found in literature. Verma, (2001); Darley and Sanmugaratnam, (1993) reported that the majority of small-holder farmers are women who produce food crops using traditional farming methods.

Apart from classifying farming as traditional, based on knowledge acquisition methods, farmers also were further asked to describe what that they understand as traditional, mixed and modern farming. Describing what farmers saw as traditional farming, three important themes emerged throughout the six areas of study. See Table 5.4.

Table 5.4 Themes of farming classification

Themes	**Percentages (100%)**
Use of this practice since young	64
The use of kraal manure	19
Use of traditional farming implements	17

From these three themes, the majority 42 (64%) of farmers mentioned having used traditional farming methods since they were young. The use of kraal manure was cited by 12 (19%) and use of traditional farming methods was mentioned by 11 (17%) of the farmers. These findings show that farmers see traditional farming from different perspectives and also that farmers are knowledgeable about their practices. The use of kraal manure as the reason for seeing farming as traditional is supported by what is found in literature. Mkhabela, (2006); Pound & Jonfa (2005) indicated that the use of kraal manure is an old traditional soil fertility strategy. These findings also contribute to one of the features of traditional agriculture; reliance on locally available resources. Though the use of traditional farming implements was not widely mentioned, 17% cited it as the main reason to classify farming; traditional farming implements were mentioned as part of land preparation methods.

5.2.3 Land preparation and implements used

Commonly mentioned traditional farming implements include the hoe and the ox-plough. *Igeja*[1] was found to be used by all (100%) farmers. Two types of hand hoes were mentioned by farmers. There is a tang forked hoe and a plain tang hoe, with the plain being widely used. Both the types mentioned were observed during the period of study. See Figure 5.3.

Figure 5.3 Commonly used hand hoes

[1] local name for hand hoe

However, the majority (85%) of farmers use the hoe mainly for weeding. See Figure 5.4. These findings also confirm what was found in literature. Kuye *et al* (2006), Suma *et al* (2004) and IFAD (1998) indicated that a hoe is used for tillage, but mainly for weeding. The higher percentage of hoe used for weeding could also be attributed to the fact that the majority of farmers are women, as it was found in literature that weeding is mainly done by women (Iyegha, 2000; Joubert, 2000; Shimba, 2000).

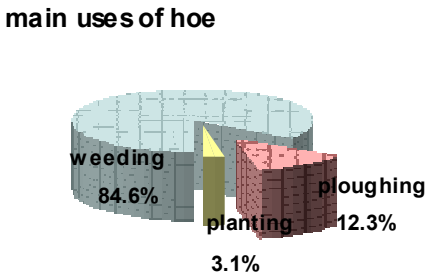

Figure 5.4 Main uses of hoe (n=65)

When testing if any relationships exist between farming classifications and the main uses of hoe, chi square results were non-significant for all variables. See Appendix C.

It can thus be concluded that there are no differences between the various farming classifications in the sample regarding the use of the hoe for farming activities. This finding also shows that these farmers do not use mechanized farming implements but rather implements that are used by the majority of other small-holder farmers throughout the world Suma et al, 2004; IFAD, 1998).

Although the hoe is found to be the main implement used by the majority of farmers, the results also show that some farmers use an ox-plough for ploughing activities. The results show that the majority (83.08%) of farmers use animal traction to prepare their fields. See Figure 5.5

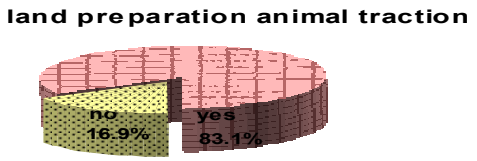

Figure 5.5 Land preparation through animal traction

The high percentages of farmers using ox-plough or animal draught implements for farming could be attributed to the fact that farmers are aware of the benefits of using animal drawn implements for reducing labour bottlenecks. This finding confirms what is found in literature. IFAD (1998) found that in some African countries women are not necessarily restricted by taboos from using animal drawn implements. Results show that land preparation through animal traction or ox-plough is common among the three farming classifications. See Table 5.5.

Table 5.5 Land preparation through animal traction (n=65)

Land preparation by animal traction	**farming mostly mixed**	**Total**
	yes	
yes	4	54
Total	5	65
	farming mostly traditional	**Total**
	yes	
yes	54	54
Total	64	65
	farming mostly modern	**Total**
	yes	
yes	5	54
Total	6	65

∗no responses account for remaining numbers

∗ no responses account for the remaining numbers

The results confirm and contradict what is found in literature. Riches *et al* (1997) indicated that most tillage operations are performed manually using a hoe and an animal drawn plough. In comparison with other developing countries, Sub-Saharan Africa ranks the lowest

compared to China, India and Latin America in terms of using animal drawn farming implements. The results also show that farmers do use a tractor for land preparation. Over a half (52.3%) of the farmers mentioned using a tractor to prepare their fields. See Figure 5.6.

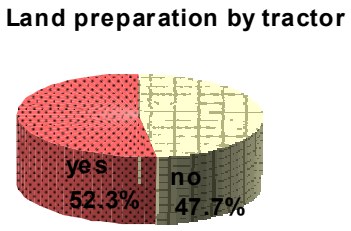

Figure 5.6 Land preparation by tractor (n=65)

The results support what Riches *et al* (1997) reported in literature. In comparison with other developing countries Sub Saharan Africa ranks the lowest compared to China, India and Latin America in terms of using animal drawn farming implements or mechanised implements such as tractor. This finding could be explained in terms of skills and affordability. Mechanised implements need skills in order to operate them and few farmers are in a position to own such implements. This supports what Karmakar *et al* (2001) found. Farmers utilise such machinery through custom hiring when they do not have their own.

Results are not significantly linked to type of farming classification. See Table 5.6. This finding could be attributed to the fact that some farmers, irrespective of farming classification, consider the benefits of increasing productivity and reducing labour bottlenecks by adopting such technology.

Table 5.6 Land preparation by tractor (n=65)

Land preparation by tractor	farming mostly traditional[1]	Total
	yes	
yes	33	34
Total	64	65
	farming mostly Mixed[2]	**Total**
	yes	
yes	4	34
Total	5	65
	farming mostly modern[3]	**Total**
	yes	
yes	5	34
Total	59	65

∗ no responses account for remaining numbers
1Chi square (p=.336)
2 Chi square (p=.197)
3 Chi square (p=.110).

Having considered the common farming implements used by farmers, farmers were asked which of the implements used are considered traditional; both hoe and ox-plough were considered traditional farming implements. Different reasons were given why these were considered traditional farming implements showing that people or farmers have different ways of ascribing both hoe and ox-plough as traditional farming implements. From the responses four main themes were developed. See Table 5.7. From the four themes developed, the most frequently mentioned themes by all farmers were 1 and 3. 52% of farmers mentioned to have used the hoe since young while 37% mentioned that the hoe has been used over along period of time even today is still in use today. The response that the hoe and ox-plough are traditional farming implements can be explained in terms of history and usage.

Table 5.7 Themes for traditional implements

Themes	Percentages 100%
1. Have used hoe since young	52
2. Hoe and ox-plough were used by our parents	11
3. Hoe was used long time ago and is still used today	37

This supports what is found in literature. Suma *et al* (2004) and FAO (1999) indicated that the hoe is the most used implement with multiple purposes over a long period of time. It is used

for tillage, and mainly for weeding. From the results, it is clear that farmers are familiar with the hoe and ox-plough and have been used over long periods of time for multiple farming activities; thus regarded as traditional faming implements.

5.2.3 Labour distribution of farming activities among household members

All the farmers interviewed mentioned that the household head is responsible for labour distribution among farming activities. Similar findings were reported in literature by Verma (2001) when indicating that decisions about labour in farming households are normally made by the household head; commonly referring to a male figure responsible for all heavy farming activities such as digging trenches, clearing land and planting certain crops. However the household head is not restricted to only men since some of the farmers are females and are household heads in their own right.

In respect of who is responsible for the four main farming activities, ploughing, planting, weeding and harvesting, different household members are responsible. The majority (76.9%) of both male and female farmers indicated that ploughing fields is the primary responsibility of male farmers. See Figure 5.7. This finding corresponds with what is found in literature. White (2003), Verma (2001) indicated that male farmers are responsible for turning soils. This finding shows that when farmers make decisions, gender roles are also taken into consideration.

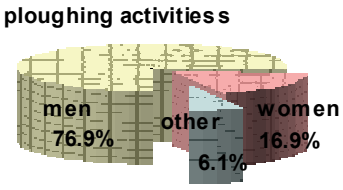

Figure 5.7 Ploughing activities

Testing for a relationship between gender and ploughing activities, a Chi square test was run (p=.019). The result shows a tendency towards relating ploughing activities to gender. It can thus be concluded that a slight relationship exist between ploughing activities and gender (men).

Table 5.8 Cross tabulation of gender of farmer ploughing activities (n=65)

Gender of farmer	Ploughing activities			
	men	women	other	Total
male	8	3	3	14
female	42	8	1	51
Total	50	11	4	65

Chi square (p=.019)

On the other hand, the majority (81.5%) of farmers felt that planting activities are primary responsibilities of women's. The results show that planting activities are perceived to be women activities especially as this perception is also held by women themselves. See Table 5.9

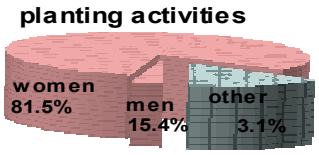

Figure 5.8 Planting activities by gender

The results confirm what was found in literature. Kuye *et al* (2006) indicated planting activities are usually carried out by women while men are turning the soils. Chi square test was run to determine if there is any relationship between planting activities and gender. The results (p=.003) reflects great significance between planting activities and gender (women).

Table 5.9 Cross-tabulation for gender of farmer and planting activities (n=65).

Gender of farmer	Planting activities			
	men	women	Other[1]	Total
male	1	7	6	14
female	1	46	4	51
Total	2	53	10	65

1. Hired labour or children

It can thus be concluded that the labour force for planting activities come primarily from women with men and others who participate in planting contributing small portions of labour.

This finding shows that though men carry out the most difficult task of turning the soil, women play the vital role of planting crops.

Due to the recognition that women play a vital role in weeding activities, farmers were asked who is responsible for weeding activities. The majority (90.8%) of farmers indicated that women are responsible for weeding activities. See Figure 5.9.

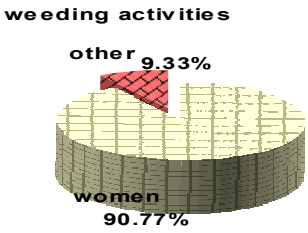

Figure 5.9 Division of labour in weeding activities.

The finding could also reflect that female farmers use working groups who are primarily women and cannot afford to hire labour for weeding. Hunduma (2006) found that farming families have traditional working groups that perform different farming activities especially weeding and harvesting. *Kadhaa* is a group that is asked to help during ploughing or weeding and harvesting. It can thus be concluded that weeding is a primary responsibility of women in traditional farming systems.

When investigating if a relationship exists between gender and weeding activities, Chi square results (p=.075) show that there is a tendency towards a significant relationship between men and women when carrying out weeding activities. The term indicated as "other" refers to labour by children or hired labour.

Table 5.10 Cross-tabulation for weeding activities and gender of farmer (n=65)

Weeding activities	Gender of farmer		Total
	male	female	
women	11	48	59
other	3	3	6
Total	14	51	65

The main distribution of weeding labour being female can be also explained in terms of history and socio-economic factors of the farmers. This finding reflects what was found in

literature. Hunduma (2006), Iyeqha (2000), Joubert (2000) and Shimba (2000) reported that weeding is an old weed control strategy prevalent in many traditional farming systems and is normally carried out by women and children and in cases where labour bottlenecks are experienced, traditional working groups or hired labour is sought.

Harvesting is an equally challenging farming activity as a result both male and female farmers mentioned that harvest labour is mainly contributed by women and household members. See Figure 5.10. The results show that 69.3% of labour during harvesting is contributed by women while only 30.8% is contributed by other[2].

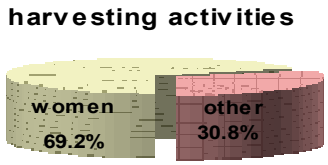

Figure 5.10 Labour distribution of harvesting activities

This finding reflects what was found in literature. Chimbidzani (2006), Suma (1996), Pala (1983) indicated that the majority of farming activities are carried by women and other, especially harvesting and carrying crops home, while men are responsible for other activities such as rearing livestock and building granaries.

Chi square results (p=.016) show a tendency towards a significant relationship between harvesting activities and gender. See Table 5.11. It can therefore be concluded that women contribute largely during harvesting activities while men do not contribute significant labour inputs for this task.

[2] the "other" referring to other household members

Table 5.11 Harvesting activities and gender distribution

Harvesting activities	gender of farmer		Total
	male	female	
Women	6	39	45
other	8	12	20
Total	14	51	65

Another consideration to be noted from the results is that labour inputs are purely based on family labour and this finding contributes to characteristics of traditional agriculture reviewed in literature. Chimbidzani (2006) indicated that members of the household engage in various farming activities simply because the majority of small-holder farmers cannot afford hired labour. This by implication demonstrates the importance of following traditional farming practices.

From the results discussed above it can thus be concluded that EFO farmers mainly classify their farming practices as traditional irrespective of gender and membership of farming organisation but purely because of the similar practices observed and experienced over time. From the findings, it can also be concluded that farmers use farming implements that were used from when they were still young and that knowledge about the various uses of such farming implements is similar among farmers of both genders; thus these implements are traditional farming implements. It can also be concluded from the above results that the majority of farmers are females and that labour distribution among various farming activities is dominated by women. Though men contribute largely to preparing land, this is mainly how far their contribution can be observed. In addition, labour inputs are purely based on household members; thus farmers minimise production costs caused by hiring labour. It can thus be concluded that traditional farming practices are evident and are still practiced today among the farmers.

The next section discusses the cropping patterns as followed by farmers in the area of study and various crops produced under such cropping patterns.

5.3 Cropping patterns and common crops produced

Two major cropping patterns were observed and mentioned by the farmers. All farmers interviewed mentioned either intercropping or crop rotation as the major cropping pattern practised.

5.3.1 Intercropping

Intercropping is one of the important cropping patterns followed by the majority (87.7%) of farmers. See Figure 5.11.

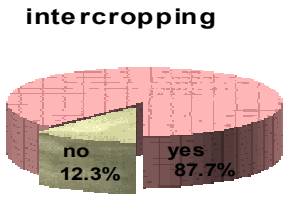

Figure 5.11 Intercropping patterns

This cropping pattern was also found to be evenly spread among EFO and non-EFO members and the chi square results (p=.722) show a non-significant relationship. See Table 5.12

Table 5.12 Intercropping and EFO membership

Intercropping	EFO membership		Total
	no	yes	
no	1	7	8
yes	10	47	57
Total	11	54	65

Chi square (p=.722)

The results also show that intercropping is not significant when linked to farming classifications. This finding supports what was found in literature. Intercropping is a cropping system that has been practiced by many farmers throughout the world for many years and is still so today (Kuye *et al*, 2006; Silwan and Lucas 2002). Graves *et al* (2004), Vandermeer (1989) also indicated that intercropping is widely practiced in Africa, Latin America and Asia and is considered as a traditional means of reducing risk and ensuring crop production in many developing countries.

Table 5.13 Intercropping and farming classifications (n=65)

Intercropping	farming mostly mixed[1]		Total
	no	yes	
yes	53	4	57
no	7	1	8
Total	60	5	65
	farming mostly traditional[2]		Total
	no	yes	
yes	1	56	57
no	0	0	8
Total	1	64	65
	farming mostly modern[3]		Total
	no	yes	
yes	53	4	57
no	6	2	8
Total	59	6	65

1 chi square (p=.586) 2. (p=.706) 3. (p=.100)

The results also show that gender is not significantly linked to intercropping with chi square (p=.114). See table 5.13. All (100%) male farmers interviewed and the majority (84.3%) of female farmers practice intercropping. See Figure 5.12.

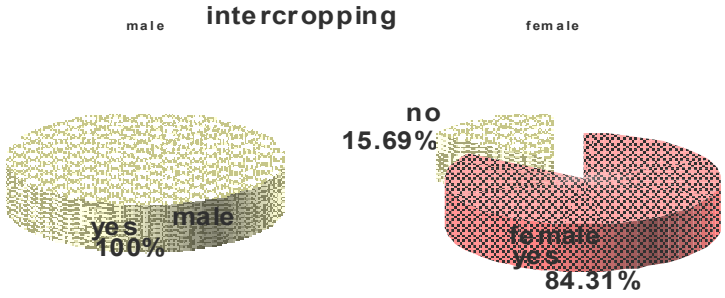

Figure 5.12 Intercropping by gender (n=65)

When asked which crops are commonly intercropped, three categories emerged; two crop mix, three crop mix and four crop mix. See Table 5.14.

Table 5.14 Intercrop categories (n=65)

Intercrop Category 1	Intercrop category 2	Intercrop category 3
maize	Maize	Maize
beans	pumpkins	beans
pumpkins		Sweet-potato/potato
78.5%	17.3%	4.2%

The majority of farmers (78.5%) identified the three crop mix as the most followed cropping mix. The second category was slightly (17.3%) mentioned, while the third category was mentioned by a few (4.2%).

The results reflect what was found in literature. Mkhabela (2006), Tsubo *et al* (2003) and Dakora & Keya (1997) indicated that common intercrops in South Africa and Uganda include legumes such as cowpea; chickpea, groundnuts, beans and pigeon-pea with cereals such as sorghum, millet and maize. The dominance of maize as the main intercrop could be attributed to the fact that maize is the staple crop in many countries in Africa (Efa *et al*, 2005)

Figure 5.13 Maize intercropped with pumpkins/ Pumpkins intercropped with amadumbe

When farmers were asked why they practice intercropping, three main themes were developed with reference to the three intercropping categories mentioned earlier. See Table 5.15. Maize/bean/pumpkin intercropping was practiced by the majority (65.0 %) of farmers mainly because the three crops are consumed in various ways at various stages. Farmers also indicated that they prefer intercropping beans since beans rejuvenate soils. Other farmers (20.

0%) prefer intercropping maize and pumpkins mainly because maize is able to stand harsh environmental condition such as less rainfall as compared to pumpkins. The remaining farmers (15.0 %) indicated that this intercropping mix is influenced by the quantity of seed. During planting when seeds are not enough, available space is filled with various other seeds available.

The results confirm what was found by Mkhabela (2006), and Silwana and Lucas (2002) in South Africa (KwaZulu-Natal and Eastern Cape), reported that maize-based intercropping system was the dominant cropping system with intercrops being bean/potatoes/pumpkins among small-holder farmers, with similar findings prevalent throughout Africa. Maponga & Muzarambi (2007) found a similar cropping mix in Zimbabwe.

Table 5.15 Intercropping categories and themes (n=65)

Intercrop categories	Percentages (%)	Themes
Maize/beans/pumpkins	65.0	Importance of the crop
Maize/pumpkins	20.0	Benefits of crop
Maize/beans/ sweetpotato/potato	15.0	Quantity of seed

This finding supports what was found in literature. Nuwabaga *et al* (1999) reported that farmers practice intercropping for reasons such as increasing food security, inadequate land and to reduce risk of crop failure.

5.3.2 Crop rotation

In addition to mentioning intercropping as the widely practiced cropping pattern, the majority (90.8%) mentioned also practicing crop rotation while a few (9.2%) mentioned not practicing crop rotation. See figure 5.14.

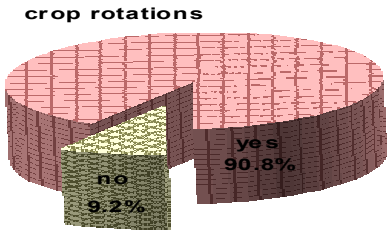

Figure 5.14 Crop rotation practices (n=65)

However, when comparing crop rotation practices and EFO membership, results show a significant relation. These results also show that crop rotation is not significant when linked to farming classifications. See Table 5.16.

Table 5.16 Cross-tabulation of crop rotation and EFO membership

Crop rotation	EFO membership		Total
	no	yes	
no	4	2	6
yes	7	52	59
Total	11	54	65

Chi square (p=.001)

This implies that crop rotation is one of the common cropping patterns among farmers, especially EFO members. The results corroborate what was found in literature. Silwana & Lucas (2002); Liebman & Dyck (1993) indicated that crop rotation is an old cropping system followed by majority of farmers in developing countries in an attempt to rejuvenate their soils and maintain good yields.

Table 5.17 Crop rotations and farming classifications

Practice Crop rotation	**farming mostly traditional[1]**		**Total**
	no	**yes**	
yes	1	58	59
no	0	6	6
Total	1	64	65
Crop rotations	**farming mostly mixed[2]**		**Total**
	no	**yes**	
yes	55	4	59
no	60	5	65
	farming mostly modern[3]		**Total**
	no	**yes**	
yes	54	5	59
Total	59	6	65

1Chi square (p=.748)
2. Chi square (p=.387)
3. Chi square (p=.509)

Chi square test was run for relations between crop rotations and farming classifications see table 5.17. The results also show that crop rotation is not significant when linked to farming classifications. Chi square results were non-significant for farming classifications and crop

rotations. Farmers were further asked to describe crop rotation cycles that are followed. Farmers identified three main rotation cycles. Rotations are done in terms of crop structure. Root crops such as sweet potato, amadumbe and potatoes are rotated with maize then followed by beans. Three rotation categories were developed based on crop rotated by farmers. See Table 5.18.

Table 5.18 Crop rotation categories and percentages

Crop rotations	Percent
Amadumbe-maize-beans	67.3
Sweet-potato-pumpkins-maize	20.4
Beans-amadumbe-maize	13.3

Analysis of results shows that across the six areas surveyed, farmers follow the same pattern of crop rotation. The majority (67.3%) of farmers mentioned rotating *amadumbe* followed by maize then beans. The high percentage of *amadumbe* category being mentioned could be attributed to the fact that *amadumbe* were crops observed to be cultivated by all farmers and that is a commercial crop. Changing from root crop to cereals then legumes was explained in terms of soil fertility management. The same reasoning was mentioned by farmers in sweet-potato and beans categories. Three themes were developed from reasons given. See Table 5.19.

Table 5.19 Reasons for crop rotations

Reasons	Percentage %
Soils get exhausted	70.6
Weeds and pests are managed	23.3
Maintain yields	6.1

The majority (70.6%) of farmers indicated that when planting the same crop every season soils are exhausted as a result yields are reduced. This corroborates what was found in literature. Pound and Jonfa (2005) and Norton *et al* (1995) when stating that soil, in the eyes of farmers is an entity that grows, matures and becomes old due to cultivating crops on the same spot for a long period without changing. Other reasons given were (23.3%) that of controlling weeds and diseases to maintain yields. These findings (70.6% and 23.3%) indicate that though farmers do not have any agricultural knowledge through training, farmers were well aware of the benefits of crop rotation. This corresponds with what was found in literature. John (2004)

indicated that farmers are aware of the different demands for nutrients by crops though they do not know which nutrients; thus in most cases when rotating crops they consider root structures of crops to be rotated. In such cases deep rooted crops such as tubers are normally rotated with shallow rooted crops such as legumes or with crops that do not bear in the ground but rather above the ground.

5.3.3 Mono-cropping

Despite intercropping and crop rotation being dominant cropping patterns among farmers, there are some farmers who practice mono-cropping. Only a few (13.8%) of the farmers practiced mono-cropping. See Figure 5.15.

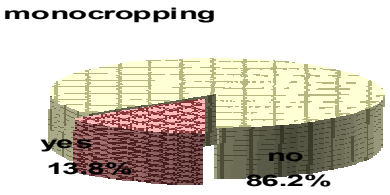

Figure 5.15 Mono-cropping patterns (n=65)

Analysis also reveals a statistically significant relationship between mono-cropping and the three farming classifications. See Table 5.20. The majority (86.1%) of those farmers who classified their farming as traditional do not practice mono-cropping. These results are not surprising since it could mean that mono-cropping was not a cropping pattern learned from their parents, thus not a characteristic of traditional farmers. These results corroborate what was found in literature. Gliessman (1998) indicated that majority of subsistence farmers rely on mixed cropping systems which support a high degree of plant diversity. When mixed and modern farmers are compared with traditional farmers, the results show a higher of practice of mono-cropping among mixed and modern farmers. These results could be attributed to the fact that mono-cropping was seen as a characteristic of mixed and modern farming.

Table 5.20 Mono-cropping across farming classifications

Monocropping	farming mostly traditional[1]		Total
	no	yes	
yes	1	8	9
no	0	58	56
total	1	64	65
	farming mostly mixed[2]		Total
	no	yes	
yes	5	4	9
Total	60	5	65
	farming mostly modern[3]		Total
	no	yes	
yes	54	5	59
Total	59	6	65

1. Chi square (p=.012). 2. Chi square (p=.000) 3. Chi square (p=.007)

These results confirm what was found in literature. Shiva (1995) indicated that mono-cropping is a common characteristic of modern agriculture with high external inputs. Sugar-cane was the only crop that was mentioned to be mono-cropped with few (9.23%) of farmers cultivating sugarcane. See figure 5.16.

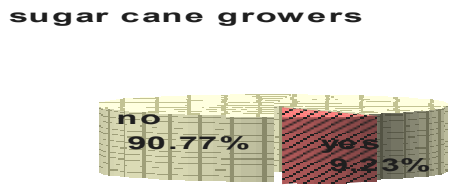

Figure 5.16 Sugarcane growing farmers

The low percentage of farmers cultivating sugarcane can be attributed to the fact that farmers are unable to meet the demands of high inputs associated with cultivating sugarcane. Investigating the relationship between mono-cropping and sugar-cane analysis show statistically significant results. Chi square (p=.000) results show that farmers who practice mono-cropping are the ones farming with sugar-cane. The results corroborate what Pionto (2002) in Brazil reported, that sugar-cane is cultivated in intensive mono-cropping systems throughout the country. The results are slightly significant (p=.075) for gender and mono-cropping thus reflecting that male farmers mainly prefer mono-cropping.

5.3.4 Agro-forestry

Across all the three farming classifications, farmers recognise agro-forestry with about one third (35.38%) practicing agro forestry. See Figure 5.17. Surprisingly, the majority of farmers who mentioned practicing agro-forestry mentioned only fruit trees. A variety of fruit trees were observed. Fruit trees observed and mentioned by farmers evenly across the six areas under study are, in order of prevalence: guava, banana, peaches and citrus.

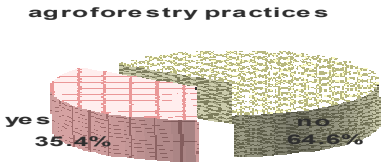

Figure 5.17 Agro-forestry Practices among Farmers

This finding reflects that farmers also rely on fruit trees for food. This corroborates what was found in literature. IFAD (2004) stated that resource poor farmers from time immemorial have relied on fruit for food and medicine. Apart from fruit trees, some wild trees were observed on the majority of farms. This finding reflects the biodiversity of plants found in farmers' homesteads and the importance of such trees to farmers' households. This finding further corresponds with Gliessman's (1998) views that the majority of traditional farmers rely on mixed cropping patterns which reflects a high degree of plant diversity displayed in poly-cultures and agro forestry patterns.

Figure 5.18 Mixed cropping and agro-forestry systems

5.4 Soil management

With consideration of the cropping patterns followed by farmers, it is important to understand various soil fertility dimensions followed by farmers. To understand how fertile soils are identified, farmers were asked what indicators they used to determine soil fertility. Four indicators of soil fertility were mentioned by farmers. See Table 5.21.

Table 5.21 Soil fertility indicators

Fertility	Colour	Texture	Moisture	Plant performance
Fertile	Dark (Blackish)	thick/soft	Capacity to hold water	Plant growth/ weeds abundance
Percent %	63.1	55.4	44.5	70.68
Less fertile	Reddish	Loose/Coarse	Dries up easily	Weak plants

(n=65 for aech soil fertility indicator)

5.4.1 Soil colour

Soil colour was identified by the majority (63.1%) of farmers as one of the indicators of soil fertility. See Figure 5.19 Colours mentioned were black and red called *iduduzi*[3] and *isibombu*[4] in local names. This finding corroborates with what was described by various authors from Nepal, Tanzania and Zambia. Price (2007), Desbiez *et al* (2006), Ngailo *et al* (1994) and Sikana (1993), described soil colour as the main feature of soil fertility, with red soils described by farmers to be very fertile. This finding reflects that farmers use soil colour as an indigenous technology learned throughout the years from previous generations. Farmers mentioned that dark (almost black) soils are the most fertile soils. This finding contradicts and also corroborates what was found in literature. Sikana (1993) reported that farmers in Zambia described red soils as the most fertile. This contrasting result may be explained by the fact that soil fertility indicators differ from region to region.

[3] iduduzi refers to dark blackish soils considered to be very fertile
[4] isipombi refers to reddish soil also moderately fertile

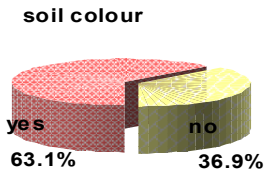

Figure 5.19 Soil colour choices and soil fertility

Establishing relationships between soil colour and farming classifications, or EFO membership, results show that no relationships exist. Chi square results for farming classifications; traditional (p=.188), mixed (p=.266) and modern (p=.486) were non significant for farming classifications. Chi square results (p=.966) for EFO membership was also non-significant.

5.4.2 Soil texture

Apart from soil colour, farmers also used soil texture as an indicator of soil fertility. However soil texture as an indicator of soil fertility is used by fewer (55.4%) farmers than soil colour. This finding contradicts what Barriors and Trejo (2003) reported. In Latin America, traditional farmers view soil texture as the most important indicator for soil fertility.

Figure 5.20 Dark, thick, soft soils in Embo

Farmers also mentioned that texture characteristics such as soil thickness or softness indicate soil fertility while looseness or coarseness of soils indicates declining soil fertility levels. 44.5% of the farmers also indicated that texture especially thickness and softness relates to water holding capacity and plant performance. This finding corroborates what Barriors and Trejo (2003) reported about perceptions of soil texture by farmers. Farmers perceive thick and

soft soils as having the capacity to hold water and plants do well in such soils. This finding can also be explained in terms of history and observation. Farmers have spent a long time in their farms; as a result they can compare different soils and also observe the behaviour of crops under such soils.

The variations in identifying fertile soils for crop production could be attributed to the fact that local people might view soil fertility from different perspectives based on wisdom and experiences of the soils (Barrera-Bassols and Zinck, 2003).

5.4.3 Soil fertility management

While distinguishing different soils for better crop production was considered important for the study, farmers were further asked how they maintain their soil fertility levels. Four strategies were used respectively by farmers of different classifications. Kraal manure, chemical fertilisers, fallow and compost were the four strategies mentioned by farmers.

- **Kraal manure**

Farmers of all three farming classifications mentioned *umqhuba*[5] (kraal manure) as the common soil fertility management strategy used. This finding reflects what Pound and Jonfa (2005) reported in literature. The commonly used manure in traditional agriculture is cattle manure. This finding can be explained by the fact that kraal manure is a naturally available resource which farmers have access to. Although all farmers mentioned using kraal manure as the main soil fertility strategy followed, mainly because they are organic farmers. Farmers also confirmed that they had earlier been using chemical fertilisers but have stopped due to dangers associated with these fertilisers and have now returned to using kraal manure. Even though all farmers used kraal manure, there were those who still used chemical fertilisers.

- **Chemical fertilisers**

Very few (7.7%) of all the farmers interviewed used chemical fertilisers. See Figure 5.21

[5] umghuba, local name for kraal manure

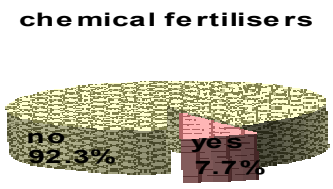

Figure 5.21 Chemical fertiliser usages

This finding can be explained by the fact that the majority of farmers use kraal manure. Also, this finding could be explained by the fact that EFO farmers are certified organic farmers and as such should not be using chemicals. See Section 3.3. Chemical fertilisers were found to be related to farmers who grow sugar cane. See Table 5.22. Analysis reveals that farmers who grow sugarcane (9.2%) use chemical fertilisers. Chi square results (p=.000) highly significant for chemical fertilisers and sugar cane growers.

Table 5.22 Sugar cane growers and chemical fertilisers (n=65)

Chemical fertilisers	Sugarcane		Total
	no	yes	
no	57	3	60
yes	2	3	5
Total	59	6	65

Chi square (p=.000)

Analysis also shows a statistically significant relationship between chemical fertiliser usage and the three farming classifications. Chi square results (p=.000) for traditional and mixed were highly significant implying that no chemicals were used with traditional farming, while less significant (p=.013) for modern farming. This finding reflects what Kaliba *et al* (1998) reported in literature, that modern maize farmers in Tanzania mainly use chemical fertilisers. From this finding it can therefore be concluded that the use of chemical fertilisers is a characteristic of modern or mixed farmers. Analysis for chemical fertilisers and gender was non-significant (chi square results (p=.931).

• **Fallow[6] and compost usage**

No significant differences were noted between fallowing and compost usage. Leaving land fallow and using compost was used by few (27.7% and 23.1%) farmers to improve soil fertility. This finding about compost, contradicts what was found in literature. Wietheger *et al* (2002) found that the majority of farmers interviewed in their study used compost and mentioned that it was suitable for their farms. With regard to farming classifications and EFO membership, result were non-significant. This implies that farmers from different farming classifications and farming organisations consider leaving land uncultivated during winter mainly because there are no winter crops. See Table 5.23.

Table 5.23 Farming classifications by EFO membership and fallow

Farming mostly traditional[1]	**Fallow soil fertility**		**Total**
	no	yes	
yes	46	18	64
no	1	0	1
Total	47	18	65
Farming mostly mixed[2]	**fallow soil fertility**		**Total**
	no	yes	
yes	5	0	5
Total	47	18	65
Farming mostly modern[3]	**fallow soil fertility**		**Total**
	no	yes	
yes	5	1	6
Total	47	18	65
EFO membership[4]	**fallow soil fertility**		**Total**
	no	yes	
yes	37	17	54
Total	47	18	65

1. Chi square (p=.526)
2. Chi square (p=.533)
3. Chi square (p=.150)
4. Chi square (p=.130)

On the other hand, results reveal that there are some gender dynamics in leaving land fallow. The majority (64.28%) of male farmers leave their land fallow while a mere 17.64% of female farmers leave their land fallow. Chi square results (p=.001) show great significant relationship

[6] Fallow is seen by farmers as leaving land uncultivated mostly during winter.

between gender and fallow. The finding can be explained in terms of gender dynamics and distance. It is possible that women tend to produce mainly on land around their homesteads while men have other plots further from home; this allowing the male farmer to leave some plots fallow and in the process rejuvenate their soils. Apart from maintaining soil fertility, farmers have other challenges of protecting crops against pests and diseases.

5.4.4 Crop protection

All farmers interviewed mentioned *umswenya* (cut worm) and *izinambuzane* (small insect) as the major pests especially in potatoes and beans. This finding corresponds with what is found in literature. Tantowijoyo and van de Fliert (2006) reported that cut worms are found in potatoes from all stages until potatoes are harvested.

The majority of farmers indicated that there is no direct method of controlling cutworms except that they apply physical control methods such as killing the worms when found and digging around the dead plant in search for worms.

Farmers also reported *umhlakava* (stem-borer) especially in maize as the most destructive pest. Farmers indicated that to control stem borer soil or ash is applied upon the stalk to flow downwards and disrupt stem-borer. See Figure 5.22

Figure 5.22 Soil applications on maize stalk demonstration

Another interesting finding for crop protection practices was that farmers are only able to identify and control visible crop pests, such as *umswenya, izinamuzane, invukuzane* (mole rat*), amasongololo* (millipedes) and birds. The major damage reported by all farmers is that caused

by mole rats and wild pigs especially in sweet potatoes. Wild pigs' damage was highly reported in KwaMahleka as compared to other areas where the main damage was caused by mole rats.

Figure 5.23 Traditional crop protection concoctions[7]

Farmers mentioned that controlling pests in their fields is very challenging since they produce their crops organically. As a result they rely on some traditional concoctions made by one of the farmers. See Figure 5.23. Concoctions are used for controlling pests such as *umswenya*, *izinambuzane* and *invukuzane.*

This finding reflects what other authors also cited in literature. Akullo *et al* (2007) and Abate *et al* (2000) reported the use of plant (*Tephrosia spp*) concoctions to control pests such as mole rat and stem borer in maize and millet. This finding can be explained in terms of experience and history. Given the fact that farmers spent a lot of time in their farms, it is thus possible to observe and experience pests' prevalence in their fields and learn their behaviour. It is common that prevalence of pests in fields is always triggered by natural causes in the environment such as drought or excessive moisture, while other pests will always prevail for certain crops even though natural factors may be absent. It is therefore not surprising why farmers reported always experiencing nematodes, insects and moles in their fields.

[7] Concoction referring to a mixture of traditional herbs known by farmer

The majority (98.46%) of farmers have no knowledge about bacterial diseases in crops. See Figure 5.24 This finding corroborates with what Abate *et al* (2000), when citing that traditional farmers are in the position to see only those pests that are observable. Analyses show that there are statistically significant relations between prevalence of bacteria and different farming classifications. See Table 5.13. It could be true that farmers are knowledgeable about pests that can be easily observed but also it should be noted that farmers might be in the position to see that something is happening to crops but due to limited knowledge, farmers are unable to say what exactly is destroying their crops.

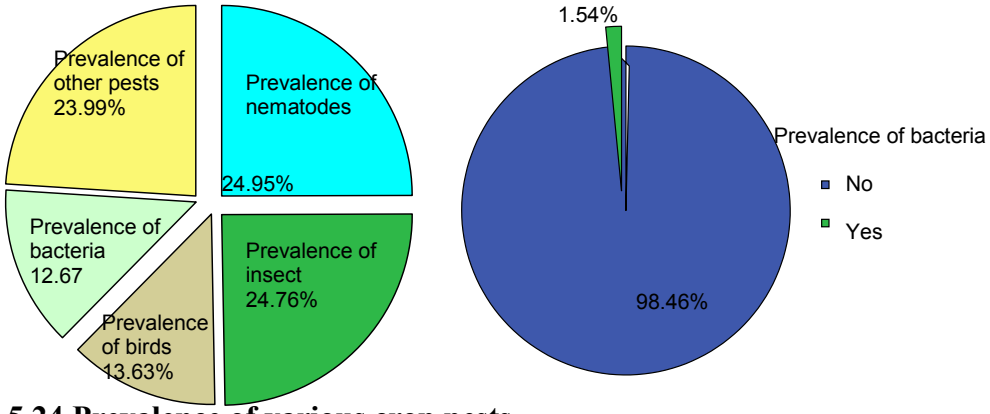

Figure 5.24 Prevalence of various crop pests

From the results it can be concluded that observing the prevalence of bacteria or fungi in crops is not a characteristic because of lack of knowledge from the farmers' perspective. Modern and mixed farmers' indication of observing bacteria can be explained by the fact that these are farmers who cultivate sugarcane and probably some sort of training was offered to them since sugar cane is seen as a modern crop to the majority of the farmers.

Table 5.24 Prevalence of bacteria per farming classification cross-tabulations

Prevalence of bacteria	farming mostly[1] traditional		Total
	no	yes	
No	0	64	64
Yes	1	0	1
Total	1	64	65
	farming mostly mixed[2]		Total
	no	yes	
	60	4	64
Yes	0	1	1
Total	60	5	65
	farming mostly modern[3]		Total
	no	yes	
No	59	5	64
yes	0	1	1
Total	59	6	65

1. Chi square (p=.000).
2. Chi square (p=.000)
3. Chi square (p=.002)

5.5 Seed acquisition, storage methods

Farmers when asked to identify the types of seeds used, two types were mentioned: landrace seeds and improved variety seeds with landraces being the dominant seed type used. Both the two types were mentioned across the three farming classifications. Information provided includes acquisition, selection and storage methods for seeds.

5.5.1 Landraces

The majority (93.85) of farmers use landrace seeds. This finding can be explained by the fact that the majority of farmers classify themselves as traditional farmers, hence cultivation from landrace seeds is one of their characteristics. The results reflect what was found in literature Smale *et al* (2001), Bellon and Brush (1994), mentioned that traditional farmers mainly use local or landrace seeds.

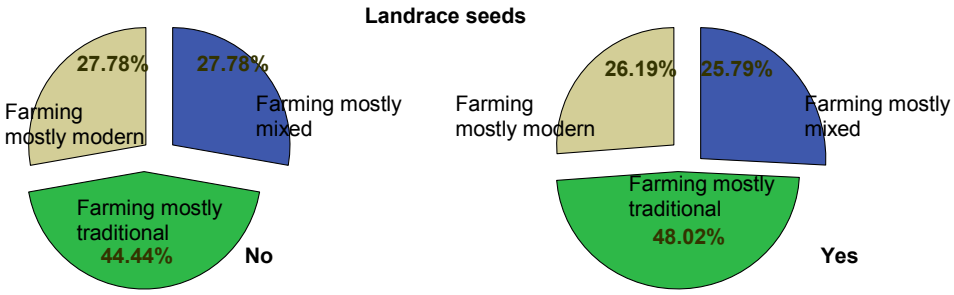

Figure 5.25 Landrace seeds usage across farming classifications

Figure 5.25 shows that landrace seeds are used by farmers from various farming classifications. This finding can be explained by the fact that even farmers who classify themselves as modern or mixed farmers do use landrace seeds just because landraces are seed types they have always used since they started farming.

Farmers, when asked why they use landrace seeds, four main themes were developed from all the responses among farmers in both face-to-face interviews and focus group discussions. See Table 5.25. The majority of farmers expressed their preference for landrace seeds based on the fact that landrace seeds can be replanted as seeds and will germinate whereas improved seeds sometimes do not germinate. One farmer expressed her preference for landraces in this quotation:

> "*I know my seeds every season when put them back in the soil they grow and I always have food*".

Farmers also indicated that landraces are good seeds since landraces are resistant to harsh environmental factors such as drought or during periods of less rainfall.

Table 5.25 Themes around landrace usage

	Landraces
Themes	Can be reused as seed
	Resistant capacity
	Assurance of plant will grow
	Taste of food from landraces

This finding corroborates what was found in literature. Hunduma (2006) indicated that landraces can withstand harsh environmental conditions and are resistant to pests and diseases. Tripp (1997) indicated that farmers choose seed varieties based on their needs. These findings can be explained in terms of history and experience. Farmers have always used landraces in a sense that they have observed how these seeds have performed over time. Farmers have also eaten food from their own seeds, thus have developed taste preferences for food from landraces. This finding corresponds with what was found in literature. Maragelo (2006) found that landrace pumpkin foods were preferred over "improved" supermarket variety pumpkins.

- **Seed selection and storage**

Farmers mentioned that seed selection is mainly based on the appearance of the crop, for example maize is selected on the weight of the cob, colour and form of the grain. It was also mentioned that absence of pests on beans and maize grains influences selection as seed. There was however, a variation in terms of when to select seeds, the majority (76.14%) of female farmers indicated that seed selection is done in the field since good crops are marked and not harvested for consumption and later are taken in and stored separately from grains for consumption. On the other hand, some farmers indicated that seed selection is done during harvest where good crops are selected and set aside. These findings contradict what was found in literature. Chigora *et al* (2007) reported that in a study conducted in Zimbabwe, most farmers select their seeds after harvest mainly because farmers become confused in the field since plants look the same. In terms of storage of seeds, all farmers indicated that seeds are stored separate from crops for consumption. This include storing in sacks and bottles, especially for beans

5.5.2 Improved variety seeds

With respect to improved varieties, very few (13.85%) use improved seeds. This finding reflects the lack of farmers' familiarity with improved seeds; as a result, frequency of using improved seeds is low. Farmers during focus group discussions mentioned that improved varieties are very difficult to manage because they can only be planted once, unlike landraces that can be replanted. This finding reflects what Efa *et al* (2005) found in a survey in Ethiopia where farmers mentioned that maize hybrid cannot be saved for planting in the next season but they have to buy every year.

Farmers were further asked how seeds are acquired. Three seeds systems were mentioned by farmers. Farmers mentioned producing their own seeds as the main method (98.46%), followed by asking from neighbours (67.69%) and buying seeds as the least (10.77%).

5.5.3 Produce own seeds

Investigating whether any relationship exists between producing own seeds and different farming classification, cross-tabulations and a chi square test was run. The results reveal statistically significant relationship between the two variables. See Table 5.26 and Appendix C for complete details.

Table 5.26 Cross-tabulations of producing own seeds and farming classifications

Produce own seed	**farming mostly traditional[1]**		**Total**
	no	**yes**	
no	0	1	1
yes	1	63	64
Total	1	64	65
	farming mostly mixed[2]		**Total**
	no	**yes**	
no	0	1	1
yes	60	4	64
Total	60	5	65
	farming mostly modern[3]		**Total**
	no	**yes**	
no	0	1	1
yes	59	5	64
Total	59	6	65

1. Chi square (p=.900)
2. Chi square (p=.000)
3. Chi square (p=.002)

The results show that farmers who classify themselves as traditional mainly produce their own seeds. It can therefore be concluded that it is the characteristic of traditional farmers to produce their seeds. This finding corresponds with what was found in literature. Akullo *et al* (2007), Corbeels *et al* (2000), reported that traditional farming systems are characterised by dependence on local seed varieties saved from the previous season. This finding could be explained in terms of biodiversity conservation. The reason could be that farmers save their

own seeds in order to preserve their preferred varieties and also save money. The results also show that farmers who classify themselves as mixed and modern farmers do not rely on producing their own seeds, it can thus be concluded that it is not the characteristic of modern farmers to produce their own seeds.

5.5.4 Ask from neighbours

The majority (67.7%) of farmers ask for seeds from neighbours[8]. This finding stands in corroboration with study conducted in Malawi. Scott *et al* (2003) reported that other farmers were main sources of seeds. This finding can be best explained based on social factors. While exchanging seeds, social relationships in a particular cultural group are maintained. Investigating if any relation exists between asking seeds from neighbours and gender, cross tabulation and chi square test were run. Analysis show statistically highly significant results. See Appendix C for detailed information.

The majority of female (76.7%) but only few male (35.8%) farmers ask seeds from neighbours. See Figure 5.26. This finding can be explained based on the fact that women are the ones responsible for feeding their households. As a result, during times of food scarcity, seeds end up being consumed; thus compelling women to ask for seeds from other farmers.

Table 5.27 Cross-tabulations for ask seeds and gender of farmer (n=65)

Ask from neighbours	gender of farmer		Total
	male	female	
no	9	12	21
yes	5	39	44
Total	14	51	65

Chi square (p=.004)

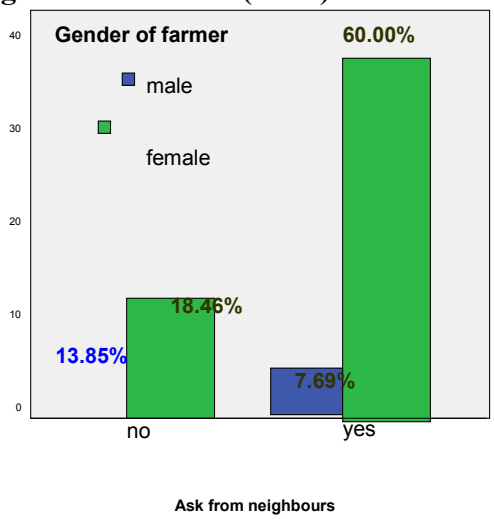

Figure 5.26 Gender of farmer and ask from neighbour

[8] Neighbours here referring to other farmers staying in the same area as the farmer

5.5.5 Purchase seeds

This is mentioned as a strategy of acquiring seeds among farmers interviewed. Relatively few (10.77%) farmers purchase their seeds from seed markets. This finding concurs with what was found by Scott *et al* (2003), markets were not important sources of seeds for farmers. However, purchasing seeds could be further explained by the relation between purchasing seeds and various farming classifications. Cross-tabulations and a chi square test show highly significant relationships between purchasing seeds and the three farming classifications. See Table 5.28 and Appendix C for detailed information.

Analysis shows that farmers who are mostly mixed and modern farmers have a high frequency of buying seeds. This finding reflects what is found in literature. Friis-Hansen (1995) reported that maize farmers in Malawi and Zimbabwe mostly buy improved varieties from markets. This finding could be attributed to the type of crop being cultivated. Also farmers could buy seeds due to seed scarcity at planting time.

Table 5.28 Cross-tabulations of purchasing seeds and farming classifications

Seed purchased	**farming mostly traditional[1]**		**Total**
	no	**yes**	
no	0	58	58
yes	1	6	7
Total	1	64	65
	farming mostly mixed[2]		**Total**
	no	**yes**	
no	56	2	58
yes	4	3	7
Total	60	5	65
	farming mostly modern[3]		**Total**
	no	**yes**	
no	54	4	58
yes	5	2	7
Total	59	6	65

1 chi square (p=.004)

2. Chi square (p=.061)

3. Chi square (p=.000).

On the other hand, this finding could reflect the characteristics of the three farming classifications identified by the farmers. This could therefore imply that the characteristic of traditional farmers is not to purchase seeds but rather to produce their own seeds, mainly based on the crops they produce. This could also imply that for both mixed farmers and modern farmers purchasing seeds is part of their characteristics based on the crops they produce.

5.5.6 Harvesting and storage methods

Farmers were further asked to describe how they know when crops are ready for harvesting. Two major crops were identified by various farmers to describe the harvest period. Three important themes were developed out of the descriptions given by farmers. See table 5.29.

Table 5.29 Themes for harvest period

Themes	Crop description for harvest	
	amadumbe	Leaves turn yellow
	potatoes	Flowers drop and plant dries out
	pumpkins	Vines dry up

In addition to a description of harvest time based on crop behaviour, farmers also mentioned counting the period from planting to harvest. This reflected that farmers are able to observe changes from time of planting till crops are ready for harvest. *Amadumbe* as the common crop in the study area was mentioned by the majority of farmers. Farmers mentioned that leaves turn yellow and start falling down. See Figure 5.27.

Figure 5.27 Yellow *amadumbe* leaves and green *amadumbe* leaves

From the Figure 5.27, *amadumbe* when still not ready has very green leaves when compared to the yellow ones that indicate readiness for harvest. This finding reflects the indigenous knowledge possessed by farmers in terms of knowing the behaviour of crops.

• Harvesting

Farmers, when asked to mention different ways of harvesting their crops, especially tubers, legumes and cereal crops, two common methods were mentioned by all the farmers. Tubers such as *amadumbe*, sweet potatoes and potatoes which are common crops grown in the area of study, are manually dug from the soil. For both amadumbe and sweet potatoes farmers indicated that a piece meal harvest is important since neither of the two tubers can be stored for a long time. This finding supports what was found in literature. Akollo *et al* (2006) and Srivastava *et al* (2006) reported that due to limited storage methods of sweet-potato, farmers employ piecemeal harvesting method.

Beans, maize and other crops are hand picked. Farmers indicated that harvesting of some crops such as beans and maize have different stages. Beans and maize are multipurpose crops; as a result; beans are harvested when pods are green and later when dry. Green pods are then consumed as green vegetables. On the other hand, maize is also harvested twice; when cobs are still green and when dry. Maize is shelled using fingers thus removing the grain from the cob. Green maize can be cooked to make *ifutho,* while dry maize is removed from the cob cooked mixed with beans to make *izinkobe.*

These findings support what was found in literature. Kuye *et al* (2006) and Byerlee (1994) reported that maize once harvested is shelled or can be left unshelled. Further processes include removing maize from the cob. Shelling involves pressing the grain off the cob with thumbs or rubbing the two cobs together. These harvesting processes are labour intensive and unfortunately with the majority of traditional farmers such activities are carried out by women (Kuye *et al,* 2006; Byerlee, 1994).

- **Storage and storage pest control**

The study found that farmers have a wealth of traditional practices for storage methods and pest control methods. When asked how their produce is stored, farmers mentioned various

methods of storing various crops. Storage for production is the major concern for all the farmers. For *amadumbe* crops, all farmers indicated that amadumbe is left in the ground and only the required quantity either for home consumption or for selling, is harvested. See Figure 5.28. This is done because *amadumbe* do not have a long shelf life; they spoil in two to three days after harvest. This finding corresponds with what Akullo *et al* (2007) cited, that tubers like cassava and taro can be buried in moist soils about one metre deep and can then last for about seven days.

Figure 5.28 Freshly harvested amadumbe for market

The majority (70.8%) of farmers mentioned using a sack to store various crops such as maize and beans; while almost half (47.7%) of farmers interviewed used plastic containers. Farmers also mentioned that sometimes they lose maize to storage pests and as a result it is important to use a tight closing container when storing maize. Other farmers cited hanging maize on the roof top inside the house above the fire place. This is done to protect maize from pests by exposing it to smoke. See Figure 5.23. This finding corresponds with what is found in literature. Hunduma (2006), Thamaga-Chitja *et al* (2004) reported that maize cobs are hung above fireplace to protect from pests. This finding reflects the wealth of indigenous knowledge held by farmers.

Figure 5.29 Potatoes and maize storage methods

Plastic containers were also mentioned to be used mainly for storing beans since most of the production is lost to storage pests (bean bruchid or weevils). To overcome this problem farmers mix beans with some orange peels and damage is said to be minimal. This finding corroborates what Allotey and Oyewo (2004) found. It was reported that orange peel powder was found to be effective in protecting seeds for a period over three months.

For baby-potato farmers, it was found during field observations that potatoes were left on the floor in the house and the farmers indicated that there was no other way to store the produce but sometimes potatoes are stored in sacks. See Figure 5.29.

5.6 Socio-economic factors of farming practices

To gather information on socio-economic factors four main questions were selected, based on the earlier informal conversations with farmers. The first question was based on factors that influence farming activities; the second focus of the question was on income generation; while the third one was based on farming reasons; and the fourth on sustainability of traditional farming

5.6.1 Factors influencing farming activities

Farmers were asked how farming knowledge is disseminated within the household. Based on responses from the farmers two main themes were developed. See Table 5.30.

Table 5.30 Themes for farming knowledge.

Them	Experience through working
	Demonstrations and observation

The majority of farmers mentioned that farming knowledge is disseminated through experience as household members are engaged in farming activities. This finding corresponds with what farmers described when they were asked how they acquired farming knowledge. It can therefore be concluded that experience as the main mode of farming knowledge acquisition is one of the characteristics of traditional farmers. The majority of farmers also mentioned demonstrating with household members and that they also observe while busy with farming activities. One farmer explained dissemination of farming knowledge among her household in this quotation:

> *"When I am working with my children, every time I do something new I call them close and show them, you see do this and this".*
> *(Farmer from Kwa-Mahleka Section)*

This finding also corresponds with what farmers mentioned when asked how they acquired farming knowledge. See Section 5.2.1.

5.6.2 Income from farming produce

Farmers were further asked if there was any income generated from farming activities and if this income was sustainable. All farmers indicated that some income is generated from production though it differs for various crops. Responses from the sustainability of generated income varied among farmers. As a result, three themes were developed. See Table 5.31.

Table 5.31 Sustainability of income

Themes	Only source of income
	Used to buy other commodities
	Not enough

The majority of farmers indicated that income generated from farming is sustainable based on the fact that there is no other source available since the majority of farmers are not employed elsewhere. On the other hand, farmers mentioned that income generated through their hard

labour in their farms helps them to buy other commodities that cannot be produced at farm level. These findings correspond with what was found in literature. Verma (2001) reported that women rely on agricultural activities partly because they are then able to meet economic demands. With regard to the last theme farmers indicated that income generated from produce is not enough since it was not generated regularly on monthly basis; sometimes there is no demand for their product.

5.6.3 Farming reasons and crops

Farmers were further asked to describe whether they farm for subsistence or for commercial reasons. The majority (62.9%) of farmers mentioned farming for subsistence, while less than half (37.1%) mentioned farming for commercial reasons. See Figure 5.30. It should also be noted that farmers' responses were not restricted to one choice only; as a result a farmer might have mentioned both subsistence and commercial reasons. Farmers explained that they farm to feed their household and also to generate some income. This finding corroborates with what was found in literature. Chimbidzani (2006) Hunduma (2006), Abate *et al* (2000) reported that production is mainly for home consumption with surpluses sold to local markets or communities thus contributing to local economies.

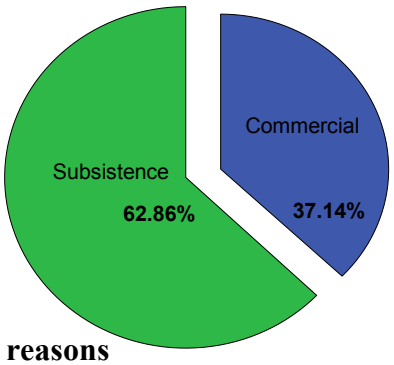

Figure 5.30 Farming reasons

This finding reflects the intention of farmers to sustain their households and ensure food supply, thus contributing to food security at household level. The 37.14% of responses for commercial reasons for farming could be attributed to the fact that the majority of farmers in this study are EFO members and produce organic amadumbe for Woolworth stores. See Chapter three, Section 3.3.

Farmers when asked to rank the crops that are considered subsistence crops, five commonly grown crops were mentioned. The top three most important subsistence crops were maize, followed by beans and *amadumbe*. Less important subsistence crops were potatoes and pumpkins. Maize was regarded as the most important (23.0%) crop because farmers saw it as a multipurpose crop. *Amadumbe* was the second (20.6%) important crop based on the fact that it is consumed in all households. Beans (20.6%) were also chosen based on the fact that it is also a multipurpose crop, consumed while green and also when dry.

Farmers were also asked to rank the most important commercial crops; four commonly grown commercial crops were mentioned. The top three were *amadumbe* (36.8%), maize (23.1%), beans (19.2%). See Figure 5.31. The fact that sugarcane was not mentioned as the main important cash crop could be attributed to the fact that very few of the farmers interviewed are sugarcane farmers.

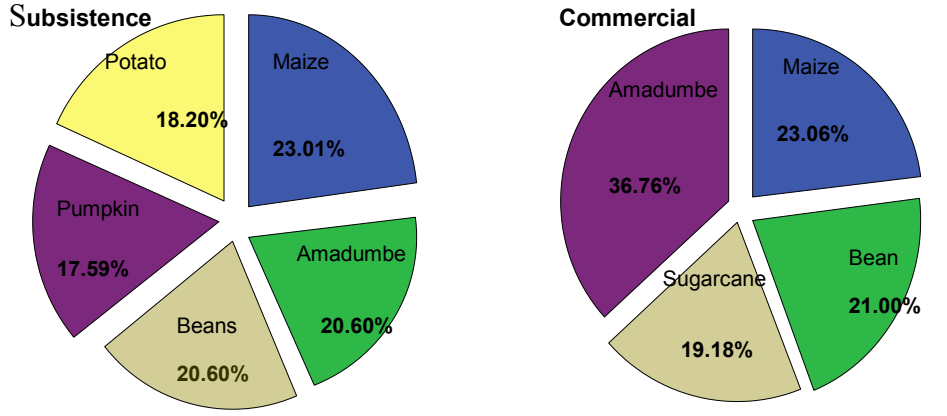

Figure 5.31 Subsistence and commercial crops (n=65)

When comparing the top three subsistence and commercial crops, it can be concluded that all the crops are highly regarded as both subsistence and commercial crops. These results concur with literature. Songa and Rono (1998) mentioned that legumes and cereals play an important part in livelihoods of small-scale farmers. The importance of the crop as commercial or subsistence crop influences how land is distributed and resources are used. Farmers indicated

that for a commercial crop like amadumbe, more land will be allocated and more manure applied to the soil since *amadumbe* is their main source of income.

Farmers, when asked what they will do with their surplus crops after harvest, the majority (84.6%) mentioned that they will sell the surplus while only (10.8%) mentioned increasing storage. Investigating whether to sell surplus and increase storage was not influenced by other farming classifications, all variables were non-significant. See Appendix C. It can therefore be concluded that to sell surplus is the characteristic of all farming classifications. The decision not to increase storage could be attributed to the fact that farmers are minimising risk since they mentioned having challenges with storage pests.

Farmers when asked how they perceive their farming, all farmers perceived farming as efficient. The reason why farmers perceive their farming as efficient could be explained by the fact that they are able to sustain their livelihoods. Very few (10.8%) farmers perceived traditional farming as expensive. See Table 5.32 for full details.

Table 5.32 Expensive perception and farming classifications

farming mostly traditional[1]		**perception expensive**		**Total**
		no	**yes**	
	no	0	1	1
	yes	58	6	64
Total		58	7	65
farming mostly mixed[2]		**perception expensive**		**Total**
		no	**yes**	
	no	56	4	60
	yes	2	3	5
Total		58	7	65
farming mostly modern[3]		**perception expensive**		**Total**
		no	**yes**	
	no	54	5	59
	yes	4	2	6
Total		58	7	65

1. Chi square (p=.004)
2. Chi square (p=.000)
3. Chi square (p=.016).

Analysis shows a highly significant relationship between perception and farming classification. The majority of farmers who perceived farming as expensive are the modern and mixed farmers. This could be attributed to the fact that farmers from these classes used

external inputs such as buying seeds and chemical fertilizers. On the other hand very few of traditional farmers perceived farming as expensive, and this reflects their reliance on locally available resources.

This finding corresponds with what was found in literature. Akande *et al* (2006), Makhabela (2006), Tire (2006) reported that traditionally farmers make use of resources available in their farming environment and these resources are well matched to maintain production.

Nearly (49.2%) of farmers interviewed perceived farming to be time consuming. See Table 5.33 and Figure 5.32. This finding could be explained in terms of gender dynamics. The chi square (p=.000) results reflect a highly significant relationship for gender and perception of time consuming. These results reflect the multi-roles played by women, since women are responsible for the majority of farming activities.

Table 5.33 Cross-tabulations for perception time consuming and gender

gender of farmer	perception time consuming		Total
	no	yes	
male	12	2	14
female	21	30	51
Total	33	32	65

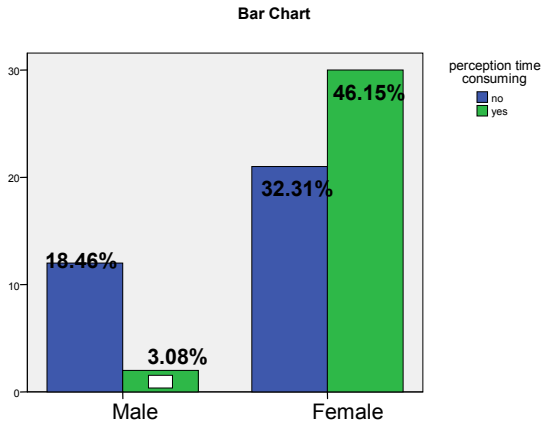

Figure 5.32 Time consuming perception by gender

The majority of farmers perceived farming as labour intensive. Analysis shows non-significant results for any type of farming classification. This could be due to the fact that the majority of farming activities are carried out manually.

Table 5.34 Labour intensiveness and farming classifications

Perception as labour intensive	farming mostly[1] traditional		Total
	no	yes	
no	0	22	22
yes	1	42	43
Total	1	64	65
	farming mostly mixed[2]		Total
	no	yes	
no	21	1	22
yes	39	4	43
Total	60	5	65
	farming mostly modern[3]		Total
	no	yes	
no	20	2	22
yes	39	4	43
Total	59	6	65

1. Chi square (p=.471)
2. Chi square (p=.496)
3. Chi square (p=.978)

Further tests were run (Chi square) to test if any relationship exists between gender and labour intensiveness. Analysis show non-significant results (p=.638) for both male and female farmers and labour intensiveness. This finding could be the result of the variety of perceptions of farming by individuals based on the amount of work and the differing sizes of land to be cultivated.

Farmers were further asked how the perceptions about their farming methods influence decisions in relation to traditional farming methods. All the farmers indicated that even though farming under traditional farming methods is time consuming and labour intensive, they intend to continue with farming.

Summary

Findings revealed that the majority of farmers perceive their farming as traditional, based on the fact that farming knowledge was mainly acquired through experience and observation and this is the method of farming they learned from their parents. Other factors that qualify farming in the study area as traditional include types of farming implements, labour

distribution, cropping patterns and crops grown. Findings also revealed that farmers mainly rely on locally available resources to maintain soil fertility as opposed to mono cropping systems. It was also revealed by findings that use of external inputs such as chemical fertilisers is not a characteristic of the majority of farmers in the study area, but only a few farmers do use these inputs mainly related to the crops produced by these farmers.

Results also show that farming plays an important role in the livelihoods of the farmers since the majority are able to generate some income, though perceptions about the sustainability of cash generated from farm produce differs. On average it can be concluded that farmers are satisfied with the income generated from farm produce.

Lastly farmers perceive their farming to be sustainable based on the fact that the intention is to increase the practice of traditional farming.

CHAPTER SIX: CONCLUSIONS AND RECOMMENDATIONS OF THE STUDY

6.0 Summary

Throughout the world, the majority of small-holder farmers produce food crops using traditional farming methods based largely on indigenous agricultural knowledge. Reviewed literature has shown that these farmers have more or less similar characteristics which are used to define these farmers as traditional. However farming from a traditional perspective has been perceived as primitive and inefficient but perceptions have however not stopped farmers from following traditional farming methods; instead farming has continued under these methods and is the backbone of many rural communities livelihoods in many developing countries of Africa, Asia and Latin America.

The purpose of this study was to investigate farming methods followed by farmers and determine its meaning in the lives of rural small-holder farmers of Embo. The study primarily investigated what is understood as traditional agriculture in the context of the farmer, how is knowledge about this practice acquired and transferred to household members, what influences farming practices that are followed and what differences exist between traditional farming methods as compared to modern or mixed farming methods. The study also investigated how gender, EFO membership, and the different farming classifications relate to farming methods followed.

Data collection was carried out using field observations, face-to-face interviews and focus group discussions. These methods were used to gather information on farming methods followed by farmers and how important this farming is for the farmers. The study was both qualitative and quantitative with all qualitative data being reduced to themes for analysis and quantitative data analysed using cross-tabulations and chi square tests from SPSS.

Results relating to how farmers perceive their farming revealed that the majority of farmers (98.5%) see their farming as traditional. Farming knowledge was said to be acquired mainly through observations and experience. Land preparations are done using manual implements and the predominant farming equipments are hoes and animal traction and are considered traditional implements. However, just over a half of farmers (52.3%) used tractors specifically

for ploughing their fields. Household members were the main pool of labour for all farming activities with household heads responsible for labour distribution among farming activities.

Common cropping patterns followed include intercropping (87.7%) and crop rotations (90.8%) and a few practice mono-cropping (13.8%) and agroforesty (35.4%). Intercrops include maize, with manly beans and pumpkins. Rotations include legumes, cereals and tubers. Sugarcane was found to be the sole mono-crop in the area.

In terms of soil management, farmers know which soils are fertile from soil colour, texture and the performance of crops on such soils as the main indicators of soil fertility. Kraal manure was found to be the dominant soil fertility management strategy followed although a few farmers also used compost (23.1%) and chemical fertilisers (7.7%). However, farmers face challenges of pests that frequently damage certain crops and with their limited knowledge, they rely on some traditional methods and concoctions to control such pests.

It was also found that landrace seeds are dominant seed types used which are preserved from previous season's produce or requested from other farmers. Farmers cited various traditional harvesting and storage methods with manual picking and digging from the soil being the dominant harvesting methods. Sacks and plastic containers were found to be the main storage methods although a few farmers did mention hanging maize above fireplace as a storage method. All these methods are similar to characteristics of traditional farming found in reviewed literature; thus most of these farmers can be deemed to be traditional.

Results relating to what influences farming activities, revealed that farming decisions are mainly made by household heads, and how labour is distributed among household members. These decisions are made with respect to choice of crops to be cultivated, what piece of land to be distributed to which crop depending on the importance of the crop as subsistence or commercial crop. Crops such as maize, beans and amadumbe are highly regarded as both subsistence and commercial crops and are given first preference when allocating resources such as land, labour and manure. Results also revealed that farming activities are carried out using household labour with women having more responsibilities of planting, weeding and harvesting. Farmers are more prepared to continue farming using traditional farming methods

since they are able to generate some income. Thus farmers view their farming as efficient due to the fact that it is not expensive, though labour intensive.

Results pertaining to the differences between traditional farming, modern and mixed farming revealed that the main differences are in cropping patterns, seed types and soil fertility management. It was found that modern and mixed farmers mainly prefer mono-cropping, use mainly improved seed varieties and soil fertility management is viewed from the application of chemical fertilisers as well as kraal manure. Modern farmers and mixed farmers prefer buying seeds, thus perceive farming as more expensive based on the fact that each season they have to buy fertilisers and seeds.

6.1 Conclusions

Conclusions of this study are drawn based on the results of the study and sub-problems. The main purpose of this study was to investigate farming practices followed by farmers in respect of food crop production and secondly to understand what influences the continual practice of such farming practices among rural farming communities of Embo in KwaZulu-Natal.

6.1.1 Conclusions for sub-problem 1: What is understood as traditional agriculture? How is knowledge about this practice acquired and transferred to household members?

The study concludes that farming is viewed as traditional among the sampled farmers largely because farming knowledge through observations and experience when carrying out farming activities. This could be attributed to the fact that farming is the main livelihood strategy. As a result farmers have been involved in farming activities from a very tender age and also their children have also copied this farming system making it a cyclical learning process. Farming implements such as the hoe and animal drawn implements used by farmers also contributed to how farming is viewed among the farmers largely due the history behind the usage of these farming implements. It is also from this perspective that farmers follow cropping patterns such as intercropping and crop rotations and produce specific crops to sustain their households using locally available resources and landrace seeds. Main sources of seeds are own production and other farmers. Seeds are selected in the fields based on good appearances. These seeds are then stored separate from other crops for home consumption after harvest.

This demonstrates the understanding of the importance of locally available resources by farmers as an ecological approach to farming. Soils are managed from a traditional perspective using traditional indicators to determine soil fertility and also use locally available resources to maintain fertility status. Crops are protected from pests employing locally known methods though prevalence and damage caused by these pests is worrying and these methods are acknowledged to be less successful. Invisible pests do not have traditional remedies.

It is thus concluded that when farmers view themselves as traditional, characteristics that define them include how knowledge is acquired, farming implements used, cropping patterns followed, dependence on locally available resources for soil fertility management such as kraal manure, traditional crop protection practices followed and the use of landrace seeds. It is therefore concluded that sampled farmers satisfy the definition of traditional farmers based on these characteristics.

6.1.2 Conclusion for sub problem 2: What influences farming practices that are followed?

This study concludes that traditional farming methods are largely influenced by history and the benefits farmers perceive from these farming methods. Farmers have always followed traditional farming methods over a long period and have been able to feed their households through their participation in farming activities.. Although traditional farming methods are criticised by outsiders, farmers are happy and confident about their farming practices. They also used to view their farming as of low status, but with the possibility of being organic farmers with a market, there seems to be more pride about their farming systems. It is true that these farmers do not live in isolation; there are some agricultural researchers, extension offices who from time to time consult with farmers for agricultural improvements. However, farmers value their farming methods largely because they employ locally available resources and household labour; thus keeping farming costs low. It is also true that the majority of these farmers are certified organic farmers, who mainly produce organic *amadumbe* for consumption and to sell, it is also anticipated that methods employed to produce these crops are not different from what farmers believe to be traditional.

The ability to generate some income from farming produce also contributes to the continuation of this farming practice because farming is their main source of income since the majority of them are not otherwise employed. The study thus concludes that farmers follow traditional farming methods not only because other methods of farming such as modern farming are beyond their means, but because they are comfortable and confident with their methods and are able to feed their households and contribute to local economies.

6.1.3 Conclusions for sub-problem3: What are the differences between traditional, modern and mixed farming classifications.

The study concludes that the main differences between traditional farming, modern and mixed farming emanates from three sources; cropping patterns, soil fertility management and seed types. With regard to cropping patterns the study concludes that traditional farmers prefer mixed cropping patterns, mainly intercropping and crop rotation, due to cited benefits. On the other hand the preference of mono-cropping by modern and mixed farmers is largely influenced by the cultivation of sugar cane. This study also concluded that mono-cropping is not a characteristic of traditional farmers; that alone explains why traditional farmers do not prefer mono-cropping patterns and also that it is not an observed and experienced cropping pattern that farmers could have copied from others. There has been a focussed initiative to encourage sugar cane farming in the area.

This study also concludes that use of kraal manure as soil fertility management strategy is a characteristic of traditional farmers while the use of chemical fertilisers is a characteristic of modern and mixed farmers. This could also be attributed to the fact that traditional farmers are more involved in producing traditional crops that were never grown with the use of chemical fertilisers; thus farmers have not experienced the use of chemical fertilisers from their parents.

This study concluded that traditional farmers use landrace seeds in comparison to modern farmers and mixed farmers. The latter use improved varieties of seeds and this is largely influenced by crops grown such as sugarcane and exotic vegetables. It is thus concluded that use of landraces is a characteristics of traditional farmers.

6.2 Recommendations of the study

Recommendations of this study are made for farmers, extension officers and agricultural scientists and for further research. These recommendations will contribute to all stakeholders in the maintenance and improvement of this farming system.

6.2.1 Recommendations for farmers

Based on the conclusions made for this study, there is a need to make some recommendations for farmers to consider. Recommendations are based on loop-holes observed in this farming system, which include documenting farming processes, forming labour support groups, starting to experiment with their innovations on their farms and develop knowledge sharing workshops

- **Documenting farming processes**

Since it is apparent that traditional farming is the preferred method of farming and farming knowledge is acquired through observations and experiences, it is equally important for farmers to start documenting their farming methods. This can be done by developing simple learning materials that detail all the processes followed in traditional farming and these materials can be made available to farming communities and even be taught in schools as extra curriculum. This will help to carry forward the knowledge about traditional farming methods largely because the majority of young people are migrating to urban areas. This will be for the benefit of those who will consider farming in rural setting. This will also benefit the farmers since agricultural scientists will be in the position to understand the position of the farmers before designing any technologies.

- **Labour support groups**

Since it is clear that women have the largest farming labour burden, it is important that farmers consider forming labour support groups in order to ease the burden of labour. This can be done by forming planting and weeding support groups that rotate among farmers when planting and weeding activities start. These support groups need not be paid but the host at each turn can provide food for that day and that planting and weeding activities are carried out on his/her farm. This move will not only ease the burden of labour but will also strengthen social ties among the farming community. This is done in Embo but on a very limited basis.

6.2.2 Recommendations for extension officers and agricultural scientists

It is important that extension officers and agricultural scientists recognise what farmers already know and what is important in the eyes of farmers before introducing any new technologies, largely because farmers value their farming methods. It is important that field workers arrange workshops for farmers where farmers can be able to learn innovations from other farmers from other areas. Farmers seem to learn better from other farmers adaptations.

With regard to agricultural scientists it is recommended that technologies introduced to farmers be of appropriate scale so that farmers can be able to incorporate them into their farming system. This will help to maintain the confidence of the farmer and bridge the technology divide.

6.2.3 Recommendations for improving the study

From the preceding chapter it is clear that the sample was small and confined to areas where EFO farmers are found; thus results could not be generalised to the entire farming population of Embo It may also be that the sample could be homogenous based on the fact that the majority are EFO members. It is recommended that the study can be improved by involving a bigger sample of EFO members; thus the results can be generalised to EFO. It is also recommended that further studies be conducted that can use random sampling to include the whole area to compare EFO and non-EFO farming activities and generalise the results to the entire population of Embo. Including more non-EFO farmers in the study could possibly bring about more varied results. However, having strangers in focus groups may limit the depth of information obtained.

It is recommended that farmers be individually interviewed in their respective farms rather than having all the farmers in one setting. This could bring about more varied results since farmers will be able to divulge information that he/she did not consider valuable to the group. More social aspects may have been forthcoming and greater depth of information about the reasons why some types of activities are continued and why some are not taken up.

6.2.4 Recommendations for future research

Future research with regard to investigating farming practices in rural setting including other villages in the province will contribute to the understanding of traditional and modern farming practices followed by small-holder farmers especially in rural areas. This may benefit the recognition of traditional farming methods as an efficient farming system that needs to be harnessed for improvements.

Research could also be conducted to evaluate the performance of certain crops such as *amadumbe* under traditional farming methods and modern methods. This could help in improving both methods for important crops and help in the evaluation of efficiency of traditional farming methods, using a wider group of indicators.

Research could also be conducted to address the influence of the cash economy, agricultural extension and the Embo researchers on the choices the farmers make about traditional farming.

Further studies could also be conducted where specific traditional farming methods such as the traditional concoctions used for plant protection, how they are made, when are they applied and to which crops. Such studies can clear up some assumptions that traditional plant protection methods are not effective.

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APPENDIX A1: INFORMED CONSENT LETTER

UNIVERSITY OF KWAZULU-NATAL

AN INFORMED CONSENT DOCUMENT

Dear EFO farmer

I am Kitso Maragelo, a Masters Social Sciences student in the Department of Community Resource Management, working under the supervision of Dr Modi and Professor Green at the University of KwaZulu-Natal.

My research is based on traditional farming methods in rural areas and how these methods can be harnessed to incorporate them with new technologies to improve production levels of resource-poor farmers. The information that you give to me is intended to inform the Department of Agriculture, agricultural researchers, development agents and organisations about the importance of incorporating traditional farming methods and technology for improved food production by resource-poor farmers.

You are asked to participate in this study by joining focus group discussions where some questions will be posed to you and discussed as a group. There will be only one focus group meeting that you will be requested to attend. You were selected because you are an EFO member who have field trials or live close to them.

Farmers will benefit from the study because it will encourage capacity building through a knowledge sharing workshop aimed at disseminating indigenous and modern agricultural knowledge among farmers and researchers. Participants will not be paid to participate but there will be refreshments during meetings. No video or audio recordings will be used during meetings, and any photographs taken will be shown to you. All information obtained will be available only to me as the researcher and your name will not appear on any documentation. Notes will be kept locked in my personal storage and on completion of the project will be destroyed. All information that you disclose will be treated with confidentiality and you can withdraw from the study at any time since your participation is voluntary

Contact details

Investigator: Kitso Maragelo: 0824319281

Supervisors: Professor Green; 033-260 5271

Dr Modi; 033- 260 5854

DECLARATION

I.....(full names of participant) hereby confirm that I understand the contents of this document and the nature of the research project, and I consent to participating in the research project.

I understand that I am at liberty to withdraw from the project at any time, should I so desire.

SIGNATURE OF PARTICIPANT **DATE**

APPENDIX A:2

RESEARCH OFFICE (GOVAN MBEKI CENTRE)
WESTVILLE CAMPUS
TELEPHONE NO.: 031 – 2603587
EMAIL : ximbap@ukzn.ac.za

UNIVERSITY OF
KWAZULU-NATAL

19 JUNE 2007

MS. KP MARAGELO (202522187)
SASA

Dear Ms. Maragelo

ETHICAL CLEARANCE APPROVAL NUMBER: HSS/0384/07M

I wish to confirm that ethical clearance has been granted for the following project:

"The status of traditional farming methods and impact of agricultural research in terms of food [crop] production of resource poor farmers: The case of EFO"

PLEASE NOTE: Research data should be securely stored in the school for a period of 5 years

Yours faithfully

PKimba
.....
MS. PHUMELELE XIMBA
RESEARCH OFFICE

cc. Post-Graduate Studies (Beulah Jacobsen)
cc. Supervisor (Prof. M Green)
cc. Dr. A Modi

APPENDIX B: 1

SEMI STRUCTURED INTERVIEW QUESTIONNAIRE

KEY INFORMANTS AND FARMERS

Gender ☐ Male ☐ Female

AGE:

I am conducting a study on the farming practices followed by resource poor farmers around their homesteads. The study is aimed at understanding the reasons for practicing traditional farming and how these practices sustain the livelihoods of the farmers.

PART 1

A. ECOLOGICAL ATTRIBUTES OF FARMING

Are you a member of EFO?

1. If yes, how long have you been involved? **(years).**

.....

.....

2. How did you acquire knowledge about farming?

Observation ☐ Experience ☐ Training ☐ Other ☐

3 How do you classify your farming?

Mostly traditional ☐ mostly modern ☐ mostly mixture ☐

a). If you classified your farming as traditional/modern, describe what you see as such farming?

.....

.....

.....

4. Why do you practice farming like this?

.....

.....

5 **Land use**

a).How do you divide/ distribute the land to be used for farming around your homestead?

b) Once land is identified for farming, how do you prepare land for each season?

Animal traction ☐ shifting cultivation ☐ tractor ☐ other

c). Which farming implements do you use to cultivate your land and indicate if owned?

Farming implements	Farming activities			
	Ploughing/tillage	Planting seeds	Weeding	Owned/borrowed/ rented
Hand hoe				
Sticks				
Spade				
Machete/knife				
Other				

d) Which of these implements would you regard as traditional implements and why

.....

.....

6 **Labour distribution in farming activities among household members.**

Who is responsible for deciding which household members are involved in farming activities? ☐ ☐ ☐

Household head Children Other

How is labour distributed among household members?	Ploughing or land preparation	Planting	Weeding	Harvesting
Household head(m/f)				
Male household members				
Female household members				

Are you happy with performing farming activities? 1. Yes 2. No

Why?.....

.....

6 Common food crops around the homestead

What are the common food crops grown in your homestead gardens?

Crop	Ranking in importance	Area grown last season	Yield per hectare last season (or Harvested amount)

Crop code

1. **Madumbe**
2. **Maize**
3. **Sweet potatoes**
4. **Beans**
5. **Pumpkins**
6. **Peanuts**
7. **Sugar cane**
8. **Other (specify)**

What/who influences the choice of these crops for cultivation and why?

.....

.....

7. What are the cropping patterns that you practice here?

Intercropping	Crop rotation	Mono cropping	agro forestry

a). If practicing intercropping explain the pattern in terms of crops that are intercropped. why and who decides which crops are to be intercropped?

.....

.....

b). If practicing crop rotation, explain how often do you rotate the crops, why and who decides which crops are to be rotated?

.....

.....

c). If practicing mono cropping which crops are mono cropped, why and who decides which crops are to be monocropped?

.....

d). If practicing agro forestry describe what kind trees do you have?

B. Knowledge about soils and plant protection management

Soil fertility management

8. How do you know or measure the fertility of your soils?

Soil colour ☐ soil texture ☐ other ☐

Which soils are best for good production of various crops here? Soil names if known

.....

.....

9. What would be the best way to improve soil fertility?

Fallow ☐ kraal manure ☐ chemical fertilisers ☐ compost ☐ Other ☐

Which one do you mainly use?.....

a). Who influences the choice of fertiliser to be used? .....

b). Who decides how it is to be acquired?.....

c) Who is responsible for the application of fertiliser of choice? .....

d). Who decides how often is it applied? .....

10. Is it worth while to apply the fertiliser of your preference? .....

How do you apply this fertiliser (incl quantities)? .....

.....

.....

Do yields change. for better or not (incl quantities)? .....

.....

.....

11. Do you use one of the following techniques to preserve soil moisture	Soil moisture management practices	
	Crop 1:	Crop 2
Mulch		
Cover crops		
Plastic sheets		
Drip irrigation or similar		
Other (describe)		

Plant protection practices

12. Do you experience the frequent prevalence of which of the following pests? Every season? Every few years Never	nematodes
	insects
	Bacteria
	Birds
	other

13. Who is responsible for protecting plants against pests? .....

a). How? .....

.....

b) What are the major weeds of your concern with which crops?

.....

.....

c) Who influences when weeding activities are done? .....

.....

C SEED ACQUISITION (for the major two crops)

16. What kinds of seeds do you use?	Crop 1	Crop 2
	Local variety / Improved variety	Local variety / Improved variety
Who chooses the types to be cultivated?		

17. If landraces are used, why?

.....

.....

18. How do you acquire seeds?	Produce own seeds
	Ask from neighbours
	Purchase
	Other

19. Are you satisfied with the yields from seeds types you use Yes No

Why

.....

.....

D. HARVEST AND POST HARVEST MANAGEMENT

19. Do you practice any rituals before or after the harvest? If yes describe the practice

.....

20 Who is responsible to check that crops are ready for harvest?

.....

.....

21 How do you tell that crops are ready for harvest (specify for the two major crops grown)e.g (madumbe, beans)

.....

.....

.....

.....

FOR THE TWO MAJOR FOOD CROPS

		Crop 1	Crop 2
22. How do you harvest your food crops?	Hand pick		
	Dig from soil		
	Use harvest machine		
	Other		

23 How do you store your food after harvest? (Two major crops). Who chooses the storage type? ..... Why?	Plastic bags
	Sacks
	Granary
	Clay pots
	Bury on the ground
	Other

24. For how long is your food supply available after harvest for the two major crops?

.....

.....

PART 2

E SOCIAL ATTRIBUTES OF FARMING

Who/What influences farming activities?

26. How is farming knowledge disseminated within household members?

27. Are you able to generate income from farming each season?

a). How much was this last season? .....

b). What do you feel about this amount?.....

28. What are your other sources of income in your household? How much?	Remittances	Grants	Other

29. Is income you generate from farming sustainable?

Why do you say this?

.....

.....

30. Are you farming mainly for commercial purposes or for subsistence?

If farming for sustenance what happens when you have surplus production?	Increase storage	Sell surplus

31. If farming for both commercial and sustenance

Subsistence crop	Commercial crops

Crop code

1. **Madumbe**

2. **Maize**

3. **Sweet potatoes**

4. **Beans**

5. **Pumpkins**

6. **Peanuts**

7. **Sugar cane**

8. **Other (specify)**

32. Are you happy with the manner in which the gains from farming production are used in the household? 1. Yes 2. No

Why.....

.....

34. What proportion of farming income do you use to buy or rent farming inputs (fertilisers, implements, etc)? .....

a). Is this done regularly every season? .....

.....

35. How do you perceive your farming practices? (Tick all that apply)	efficient	expensive	Time consuming	Labour intensive	Other

36. How does these perceptions influence your decisions in relation to your farming practices?

1. Less practice of traditional farming

2. Increase the practice of traditional farming

37. Are there any other aspects relating to your farming that you would like to add?

.....

.....

.....

F. PERSONAL DATA

Farmer Number	Gender	Education level	Position in household	Benefits from EFO	Main sources of farming info	Socio-economic status (assets* and farming income	

* assets include observation of housing conditions, infrastructure (water, electricity, roads), transport.

Conduct a historic timeline exercise (10 years) relating to farming production practices with the farmers, and key informants. Include traditional farming, and farming now to confirm the questions asked.

Thank you very much for your participation

APPENDIX B: 2

Imibuzo

Ubulili ☐ **indoda** ☐ **owesifazane**

Iminyaka yokuzalwa:

Ngenza isifundo ngezindlela zokulima ezisetsenziswa ngabalimi abangenzo Kahle izinto zokulima maakhaya abo. Lesisfunda sizama ukuthola izizathu Zokwesebenzisa indlela yendabuko ekulimeni nokuthola ukuthi lendle Yendabbuko iyakwazi yini ukuphilisa abalimi

A. Ezemvelo kuhlagen nukulima

Ngabe iyilunga leEFO?

1. uma uthe yebo, sesisingakanani isikhathi une EFO (iminyaka)

.....

.....

2. waluthola kanjani ulwazi ngokulima?

☐ wabona kwenziwa ☐ isipilioni ☐ wafundiswa ☐ ezinye izindlela

3.ungayibeka uthi yini lendlela olima ngayo phakathi kwalezi?

☐ Kuyindlela yendabuko kakhulu ☐ yindlela yesimanje kakhulu

☐ yizona zombili

Uma ubona ukuthi yindlela yendabuko/ yesimanje, chaza ukuthi yini ekwenza ubone kanjalo?

.....

.....

.....

4. isiphi isizathu sokuthi ulime ngaloluhlobo?

.....

.....

.....

5. Ukusetsenziswa komhlaba

a) Ngabe umhlaba niwehlukanisa kanjani ukuze nikwazi ukulima emakhaya?

b) Uma usihlukanisiwe umhlaba, ngabe niwelungisa kanja ngokwehlukana konyaka?

☐ Ngezinkabi ☐ ngogandaganda

☐ ngokwelima indawo unyaka owodwa, uyiyeke ngokulandelayo

☐ ezinye izindlela

c) Imaphi amathuluzi owasebenzisayo ukulima umhaba wakho. Ngabe lezizinto ngezakho noma uyaziboleka?

Amathuluzi	Izinto ozenzayo uma ulima			
	Ukulima	ukutshala	ukwehlakula	Ezakho/uyaziboleka
Igeja				
Izinduku				
Ihalavu/ispetu				
Imimese				
Okunye				

d) Imaphi kulamathuluzi ongawabiza ngokuthi awendabuko, yingani usho kanjalo?

.....

.....

6. Umsebenzi wokulima emndenini.

Ngabe ngubani athatha izinqumo ukuthi ngubani ozongena ekulimeni?

☐ Inhloko yekhaya ☐ Izingane ☐ Omunye

Uhlukaniswe kanjani umsebenzi phakathi kwamalunga omndeni?	Ukulima umhlaba	Ukutshala	Ukwehlakula	Ukuvuna
Unhloko yekhaya (m/f)				
Umuntu wesilisa emndenini				
Umuntu wesifane emndenini				

ngabe uyakuthokozela ukulima? 1. Yebo 2. Cha

ngabe yini isizathu?.....

.....

.....

.....

7. izitsalo ezijwayelekile emakhaya

iziphi izitshalo ezijwayelwe ukutshalwa ezinsimini zasemakhaya?

Crop	Ranking in importance	Indawo eyatsalwa ngenkathi yonyaka odlulile	Wathola isivuno esingakanani

Izitshalo

1. Amadumbe
2. Umbhila
3. Ubhatata
4. Ubhontsisi
5. Amatanga
6. Amakinati
7. Ummoba
8. Ezinye (njengaziphi)

Ngubani oshoyo ukuthi iziphi izitsalo ezizotsalwa, ngobani?

.....

.....

8. yiziphi phakathi kwazi zindlela zokulima ozisebenzisayo lana ekhaya?

Ukutsala izitsalo ndawonye	**Ukushintsisa izitsalo ngenkathi yonyaka**	**Ukutsala isitsalo esisodwa**	**Ukutsala nezihlahla nezinye izitsalo endaweni eyodwa.**

a) uma utsala izitsalo ndawonye, iziphi izitsalo ozitsala ndawonye, yinga ukhetha lezizitsalo futhi ubani othatha lesosinqumo?

.....

.....

.....

b) uma usebenzisa indlela yokushintsanisa izitsalo ngenkahti yonyaka, yingani futhi ubani othatha isinqumo sokuthi isiphi isitsalo okufuneke singe lapho bekukhona esinye?

.....

.....

.....

c) Uma utsala uhlobo olulodwa lwesitsalo, isiphi lesositsalo futhi yini utsala sona sodwa, kanti futhi ngubani othatha isinqumo ngalokho?

.....

.....

.....

d) Uma untsala ngedlela yokufaka izinto eziningi (izihlahla, notsani, nezithsalo endaweni eyodwa), ngabe iziphi lezozihlahla zezithelo ezitsaliwe)

.....

.....

.....

B. Ulwazi ngokwephathwa komhlabathi nokuvikelwa kwezitsalo

Ukugcina umhlabathi uvundile

9. ukwazi futhi ukukala kanjani ukuvunda komhlabathi wakho?

☐ Umbala womhlabathi ☐ ukuzwa ngezandla umhlabathi

☐ ngeye indlela

yiziphi izihlobo zemihlabathi okwazi ukuthola khona isivuno esihle? igama lazo (mazaziwa)

.....

.....

10. yziphi izindlela ezinhle zokuvundisa umhlabathi?

☐ Ukuyekaumhlabathi uphumule ☐ umquba ☐ Umanyolo ☐ okunye

Uyiphi indlela oyisebenzisa kakhulu? .....

a) Ngubani okhetha uhlobo lwesikhuthazo oluzosetsenziswa?.....

.....

b) Ngubani othatha isinqumo ngokuthi isikhuthazo sizotholwa kuphi?.....

c) Ngubani okumele asifake isikhuthazo?

.....

d) Nguba owenza isnqumo sokuthi sifakwa kangaki?.....

11. ngabe kuyasiza ukufaka lesisikuthazo?

Ngabe usifaka kanjani lesisikhuthazo (inani).....

.....

.....

Ngabe isivuno sona siyashintsa sibenchono na?

(inani).....

.....

.....

12. Iziphi kulezi izindlela ozisebenzisayo ukuvikela ukulahleka komswakama womhlamathi?

	Ukuvimbela ukulahleka komswakama	
	Isitsalo sokuqala	Isistsalo sesibili
Ngabe uvala ngotsani noma ngokuvunile		
Ngabe usebenzisa amaplastiki		
Ukuchelela/ukuthelela		

13. izindlela zokuvikela izitsalo

Iziphi phakathi kwalezi ezivela njalo?	Umswenya
Ngabe zivela ngezinkathi zonyaka	Izinambuzane
Njola emva kweminyaka ethize	Igciwane
Aziveli	Izinyoni
	Ezinye

14. ngubani omelele umsebenzi wokuvikela izitsalo kwizinambuzane?

Kanjani?.....

.....

15. Yuluphi ukhula olunihlupha kakhulu futhi linuhlupha kuziphi izitsalo?

.....

.....

16. Ngubani othatha izinqumo ngokuchenta/ukuhlakula?.....

.....

C. Ukutholakala Kwembhewu

17. uluphi uhlobo lwembhewu olusetsenziswayo?

	Isitsalo sokuqala	Isitsalo sesibili
	Imbhewu yendawo/ yilembhewu lezi ezithengwayo	Imbhewu yendawo/ yilembhewu lezi ezithengwayo
Ngubani okhetha uhlobo lwembhewu?		

18. Ngabe usebenzisa imbhewu ephuma ensimini yakho

.....

.....

19.

Iyithola kanjani imbhewu?	Uyazenzela imbhewu
	iyithola komakhelwane
	Uyayithenga
	Ngenye indlela

19. ngabe usagculisekile ngesivuno ositholayo ngembhewu owisebenzisayo? 1. yebo 2. Cha

Yingani usho njalo.....

.....

D. Ukuvuna no kuphatha isivuno

20. ngabe kukhona izinto sesintu ozenzayo ngaphambi kokuvuna? Uma yebo ngabe iziphi lezo zinto

.....

.....

21. ngubani omele ukubheka ukuthi izitsalo sezingavunwa?

.....

.....

22. Wazi kanjani ukuthi izitsalo zakho sezilungele ukuthi sezingavunwa, kakhulukazi lezi ezimbili obona zibalulekile kuwena?

.....

.....

Kulezi zitsalo zakho ezimbili ezibalulekile

23. ngabe uzivuna kanjani?

	Isitsalo sokuqala	Isitsalo sesibili
Uzikhipha ngezandla		
Uyazimbha		
Usebenzisa imshini yokuvuna		
Enye indlela		

24.

Ngabe isigchina kanjani isivuno sakho?	Emaplastikini
	Emasakeni
Ngubani okhetha indlela yokusichina?	Izinqolobane
	Ezimbizeni zobumbha
Ngobani?	nizimbhela phansi
	Ezinye izindlela

25. isivuna sakho sihlala isikhahi esingakanani?

.....

.....

Ngibani/yini owenza izinqumo ngindlela yokulima?

26. ludluliswa kanjani ulwazi ngokulima emndenini?

.....

.....

27. Uyakwazi ukuthola imali ngokulima kwakho ngezikhathi zonyaka?

a) **Kwakuyimali ngenkathi yonyaka edlule?**

.....

b) **Uzizwa kanjani kulenkathi yonyaka?**

.....

28. ngabe iziphi ezinye izindlela zokuthola imali emndenini? Malini?

Ngehholo	Ngohhulumeni	Ezinye

29. Ngabe imali oyithola ngokulima izikwazi ukukuphilisa isikhathi eside? Ngabe yini usho kanjalo?

.....

.....

30. Ngabe ulimela ukudayi noma ukuthi udle?

Uma utsalela ukudla, kwenzekani kokusalayo?	**Wandisa indawo yokukugchina?**	**Uyakudayisa**

31. Uma utsalela ukudla nokudayisa

Izitsalo ozidlayo	Izitsalo ozidayisayo

1.Amadumbe

2. Umbhila

3. ubhatata

4. ubhontsisi

5. amathanga

6. amakinati

7. ummoba

8. ezinye

32. kuyakujabulisa indlela okusetsenziswa ngayo imali yesivuno emakhaya?

1. yebo 2. Cha

Ngobani?.....

.....

33. kulemali oyithola ekulimeni, inxenye engakanani eya ekuthengeni/ekutselekeni izinto zokulima (izikhuthazo, amathuluzi, etc)?

.....

.....

Ngabe kwenzeka njalo nkenkathi yonyaka?.....

.....

34. indlela yokulima oyisebenzisayo uyibona i..

Eyagculisa	Iyabiza	Ichitha isikhathi	Idinga umsebenzi	Okunye

35. lokhu kwenza uthathe ziphi izinqumo ngokulima?

1. **unciphise ekusebenziseni izindlela zendalo**
2. **wandise ukusebenzisa izindlela sendalo**

36. ngabe kukhona yini ngathanda ukukubeka mayelana nokulima?

.....

.....

Inombholo yomlimi	ubulili	Izinga lemfundo		Inzuzo ye EFO	Izindawo ezibalulekile lawuthola khona ulwazi ngokulima	Socio-economic status Izintoonazo nemali enganawayo ngokulima	

Izinto onazo zibala isimo sezindlu, amanzi, ugesi, imigwaqo neokuthutha (transport)

APPENDIX B3: FOCUS GROUP DISCUSSION GUIDE

Focus group discussion guide: farmers

1. What do you describe as traditional farming?

.....

.....

.....

2. How do you distribute land for cropping

.....

.....

.....

3. What influences the choice of crops to be cultivated

.....

.....

4. How do you maintain soil fertility in your farms

.....

.....

5. How do you apple manure to your fields

.....

.....

6. How do you protect your crops from pests damage

.....

.....

7. How do you perceive traditional farming methods

.....

.....

APPENDIX B4: FIELD NOTES

Lethumula

Maize is everything — green, dry, maize meal — cook different ways.

Crop rotation / mixing to improve the soil. Because when we continue like that soil nutrients are depleted.

1. Soil fertility indicators: when ~~there~~ is the first time planting you see with plants or crops that are there, how they look like even the crops that you

Presence of mychorrhizae.

Improve soils with manure & sometimes spread manure b4 planting and leave on soils till next tillage then spread again for individual crops.

Planting all crops, mudumbe: spread along rows then cover seeds,

Mswanga: there are traditional mixtures:

1. UMAMBESA
2. UMHLANGOTHI
3. UMUKANI
4. UMNYAMBA
5. UNTUNGWA BOVANA - especially for nematodes. (cutworm does not die immediately) — Spread on potatoes or beans and the following day they dead Mols don't like maize so take 2litre, make/hole on to put on stick to rotate.

Umtshekava — stemborer, ash or soils when plants/umbila/maize is still small.

Madumba seeds are selected from those with a lot of nodes. You know they will grow/germinate.

Umutsi — traditional plants used to make plant protection mixtures.

APPENDIX C; SPSS OUTPUTS

1. Chi-Square Tests Farming classifications and gender **Chi-Square Tests**

Farming traditional	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	3.700(b)	1	.054		
Continuity Correction(a)	.487	1	.485		
Likelihood Ratio	3.128	1	.077		
Fisher's Exact Test				.215	.215
Linear-by-Linear Association	3.643	1	.056		
N of Valid Cases	65				

a Computed only for a 2x2 table
b 2 cells (50.0%) have expected count less than 5. The minimum expected count is .22.

Chi-Square Tests

Farming mixture	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	.008(b)	1	.931		
Continuity Correction(a)	.000	1	1.000		
Likelihood Ratio	.008	1	.930		
Fisher's Exact Test				1.000	.708
Linear-by-Linear Association	.007	1	.931		
N of Valid Cases	65				

a Computed only for a 2x2 table
b 2 cells (50.0%) have expected count less than 5. The minimum expected count is 1.08.

Chi-Square Tests

modern	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	.544(b)	1	.461		
Continuity Correction(a)	.047	1	.829		
Likelihood Ratio	.495	1	.482		
Fisher's Exact Test				.602	.384
Linear-by-Linear Association	.536	1	.464		
N of Valid Cases	65				

a Computed only for a 2x2 table
b 2 cells (50.0%) have expected count less than 5. The minimum expected count is 1.29.

Chi-Square Tests:Farming classifications and land preparation by animal traction

Traditional[1]	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	4.986(b)	1	.026		
Continuity Correction(a)	.790	1	.374		
Likelihood Ratio	3.631	1	.057		
Fisher's Exact Test				.169	.169
Linear-by-Linear Association	4.909	1	.027		
N of Valid Cases	65				
Mixed[2]	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	.036(b)	1	.849		
Continuity Correction(a)	.000	1	1.000		
Likelihood Ratio	.035	1	.852		
Fisher's Exact Test				1.000	.617
Linear-by-Linear Association	.036	1	.850		
N of Valid Cases	65				
Modern[3]	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	.000(b)	1	.986		
Continuity Correction(a)	.000	1	1.000		
Likelihood Ratio	.000	1	.986		
Fisher's Exact Test				1.000	.734
Linear-by-Linear Association	.000	1	.986		
N of Valid Cases	65				

1. b 2 cells (50.0%) have expected count less than 5. The minimum expected count is .17.
2. b 2 cells (50.0%) have expected count less than 5. The minimum expected count is .85.
3 b 2 cells (50.0%) have expected count less than 5. The minimum expected count is 1.02.

3. Chi-Square Tests: Land prep tractor

Traditional[1]	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	.926(b)	1	.336		
Continuity Correction(a)	.000	1	1.000		
Likelihood Ratio	1.310	1	.252		
Fisher's Exact Test				1.000	.523
Linear-by-Linear Association	.912	1	.340		
N of Valid Cases	65				
Mixed[2]	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	1.665(b)	1	.197		
Continuity Correction(a)	.680	1	.410		
Likelihood Ratio	1.789	1	.181		
Fisher's Exact Test				.358	.208
Linear-by-Linear Association	1.639	1	.200		
N of Valid Cases	65				
Modern[3]	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	2.551(b)	1	.110		
Continuity Correction(a)	1.364	1	.243		
Likelihood Ratio	2.789	1	.095		
Fisher's Exact Test				.200	.121
Linear-by-Linear Association	2.511	1	.113		
N of Valid Cases	65				

12 cells (50.0%) have expected count less than 5. The minimum expected count is.48
2 cells (50.0%) have expected count less than 5. The minimum expected count is 2.38
2 cells (50.0%) have expected count less than 5. The minimum expected count is 2.86

4. Chi-Square Tests :Ploughing activities and gender

ploughing	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	7.887(a)	2	.019
Likelihood Ratio	6.374	2	.041
Linear-by-Linear Association	6.543	1	.011
N of Valid Cases	65		
planting	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	11.889 (a)	2	.003
Likelihood Ratio	10.125	2	.006
Linear-by-Linear Association	5.680	1	.017
N of Valid Cases	65		

1.a 3 cells (75.0%) have expected count less than 5. The minimum expected count is .86.
2.a 3 cells (75.0%) have expected count less than 5. The minimum expected count is .43

5 Chi-Square Tests: weeding activities

Weeding[1]	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	3.169(b)	1	.075		
Continuity Correction(a)	1.585	1	.208		
Likelihood Ratio	2.652	1	.103		
Fisher's Exact Test				.108	.108
Linear-by-Linear Association	3.120	1	.077		
N of Valid Cases	65				

Harvesting[2]	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	5.826(b)	1	.016		
Continuity Correction(a)	4.355	1	.037		
Likelihood Ratio	5.469	1	.019		
Fisher's Exact Test				.023	.021
Linear-by-Linear Association	5.737	1	.017		
N of Valid Cases	65				

1. 2 cells (50.0%) have expected count less than 5. The minimum expected count is 1.29
2. 1cells (25.0%) have expected count less than 5. The minimum expected count is 4.31

6. Chi-Square Tests; intercropping and EFO membership

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	.127(b)	1	.722		
Continuity Correction(a)	.000	1	1.000		
Likelihood Ratio	.136	1	.713		
Fisher's Exact Test				1.000	.592
Linear-by-Linear Association	.125	1	.724		
N of Valid Cases	65				

. 1cells (25.0%) have expected count less than 5. The minimum expected count is 1.72

7. Chi-Square Tests: Intercropping and farming classifications

Traditional[1]	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	.143(b)	1	.706		
Continuity Correction(a)	.000	1	1.000		
Likelihood Ratio	.265	1	.607		
Fisher's Exact Test				1.000	.877
Linear-by-Linear Association	.140	1	.708		
N of Valid Cases	65				

Mixed[2]	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	.297(b)	1	.586		
Continuity Correction(a)	.000	1	1.000		
Likelihood Ratio	.260	1	.610		
Fisher's Exact Test				.493	.493
Linear-by-Linear Association	.292	1	.589		
N of Valid Cases	65				

Modern[3]	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	2.708(b)	1	.100		
Continuity Correction(a)	.987	1	.321		
Likelihood Ratio	2.056	1	.152		
Fisher's Exact Test				.155	.155
Linear-by-Linear Association	2.666	1	.103		
N of Valid Cases	65				

1.2 cells (50.0%) have expected count less than 5. The minimum expected count is .12
2. 2 cells (50.0%) have expected count less than 5. The minimum expected count is.62
3. 2 cells (50.0%) have expected count less than 5. The minimum expected count is .74

8. Chi-Square Tests: crop rotation and efo mebership

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	11.634(b)	1	.001		
Continuity Correction(a)	8.062	1	.005		
Likelihood Ratio	8.491	1	.004		
Fisher's Exact Test				.006	.006
Linear-by-Linear Association	11.455	1	.001		
N of Valid Cases	65				

2 cells (50.0%) have expected count less than 5. The minimum expected count is 1.02

9. **Chi-Square Tests: farming classifications**

traditional	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	.103(b)	1	.748		
Continuity Correction(a)	.000	1	1.000		
Likelihood Ratio	.195	1	.659		
Fisher's Exact Test				1.000	.908
Linear-by-Linear Association	.102	1	.750		
N of Valid Cases	65				

mixed	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	.750(b)	1	.387		
Continuity Correction(a)	.004	1	.951		
Likelihood Ratio	.595	1	.440		
Fisher's Exact Test				.394	.394
Linear-by-Linear Association	.738	1	.390		
N of Valid Cases	65				

modern	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	.436(b)	1	.509		
Continuity Correction(a)	.000	1	1.000		
Likelihood Ratio	.368	1	.544		
Fisher's Exact Test				.455	.455
Linear-by-Linear Association	.430	1	.512		
N of Valid Cases	65				

2 cells (50.0%) have expected count less than 5. The minimum expected count is .09
2 cells (50.0%) have expected count less than 5. The minimum expected count is **.46**
2 cells (50.0%) have expected count less than 5. The minimum expected count is .55

10. Chi-Square Tests: mono-cropping and farming classifications

traditional	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	6.319(b)	1	.012		
Continuity Correction(a)	1.113	1	.291		
Likelihood Ratio	4.054	1	.044		
Fisher's Exact Test				.138	.138
Linear-by-Linear Association	6.222	1	.013		
N of Valid Cases	65				

mixed	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	19.872(b)	1	.000		
Continuity Correction(a)	14.318	1	.000		
Likelihood Ratio	12.857	1	.000		
Fisher's Exact Test				.001	.001
Linear-by-Linear Association	19.566	1	.000		
N of Valid Cases	65				

modern	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	7.243(b)	1	.007		
Continuity Correction(a)	4.289	1	.038		
Likelihood Ratio	5.166	1	.023		
Fisher's Exact Test				.031	.031
Linear-by-Linear Association	7.132	1	.008		
N of Valid Cases	65				

2 cells (50.0%) have expected count less than 5. The minimum expected count is .14
2 cells (50.0%) have expected count less than 5. The minimum expected count is .69
2 cells (50.0%) have expected count less than 5. The minimum expected count is .83

11. Chi-Square Tests: sugar cane and chemical fertilisers

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	16.663(b)	1	.000		
Continuity Correction(a)	10.745	1	.001		
Likelihood Ratio	9.468	1	.002		
Fisher's Exact Test				.004	.004
Linear-by-Linear Association	16.407	1	.000		
N of Valid Cases	65				

2 cells (50.0%) have expected count less than 5. The minimum expected count is .46

12. Chi-Square Tests: fallow and farming classifications

traditional	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	.389(b)	1	.533		
Continuity Correction(a)	.000	1	1.000		
Likelihood Ratio	.654	1	.419		
Fisher's Exact Test				1.000	.723
Linear-by-Linear Association	.383	1	.536		
N of Valid Cases	65				

mixed	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	2.074(b)	1	.150		
Continuity Correction(a)	.847	1	.357		
Likelihood Ratio	3.399	1	.065		
Fisher's Exact Test				.311	.186
Linear-by-Linear Association	2.043	1	.153		
N of Valid Cases	65				

modern	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	.401(b)	1	.526		
Continuity Correction(a)	.024	1	.877		
Likelihood Ratio	.440	1	.507		
Fisher's Exact Test				1.000	.464
Linear-by-Linear Association	.395	1	.530		
N of Valid Cases	65				

2 cells (50.0%) have expected count less than 5. The minimum expected count is .28

2 cells (50.0%) have expected count less than 5. The minimum expected count is 1.38

2 cells (50.0%) have expected count less than 5. The minimum expected count is 1.66

13. Chi-Square Tests: prevalence of bacteria and farming classifications

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	65.000(b)	1	.000		
Continuity Correction(a)	15.746	1	.000		
Likelihood Ratio	10.333	1	.001		
Fisher's Exact Test				.015	.015
Linear-by-Linear Association	64.000	1	.000		
N of Valid Cases	65				

mixed	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	12.188(b)	1	.000		
Continuity Correction(a)	2.560	1	.110		
Likelihood Ratio	5.329	1	.021		
Fisher's Exact Test				.077	.077
Linear-by-Linear Association	12.000	1	.001		
N of Valid Cases	65				

modern	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	9.987(b)	1	.002		
Continuity Correction(a)	2.015	1	.156		
Likelihood Ratio	4.927	1	.026		
Fisher's Exact Test				.092	.092
Linear-by-Linear Association	9.833	1	.002		
N of Valid Cases	65				

a 3 cells (75.0%) have expected count less than 5. The minimum expected count is .02

a 3 cells (75.0%) have expected count less than 5. The minimum expected count is .08

a 3 cells (75.0%) have expected count less than 5. The minimum expected count is .09

14. Chi-Square Tests: produce own seeds and farming classifications

traditional	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	.016(b)	1	.900		
Continuity Correction(a)	.000	1	1.000		
Likelihood Ratio	.031	1	.860		
Fisher's Exact Test				1.000	.985
Linear-by-Linear Association	.016	1	.901		
N of Valid Cases	65				

mixed	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	12.188(b)	1	.000		
Continuity Correction(a)	2.560	1	.110		
Likelihood Ratio	5.329	1	.021		
Fisher's Exact Test				.077	.077
Linear-by-Linear Association	12.000	1	.001		
N of Valid Cases	65				

modern	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	9.987(b)	1	.002		
Continuity Correction(a)	2.015	1	.156		
Likelihood Ratio	4.927	1	.026		
Fisher's Exact Test				.092	.092
Linear-by-Linear Association	9.833	1	.002		
N of Valid Cases	65				

a 3 cells (75.0%) have expected count less than 5. The minimum expected count is .02
a 3 cells (75.0%) have expected count less than 5. The minimum expected count is .08
a 3 cells (75.0%) have expected count less than 5. The minimum expected count is .09

15. Chi-Square Tests: ask from neighbour and gender

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	8.343(b)	1	.004		
Continuity Correction(a)	6.584	1	.010		
Likelihood Ratio	7.892	1	.005		
Fisher's Exact Test				.008	.006
Linear-by-Linear Association	8.215	1	.004		
N of Valid Cases	65				

a 1 cells (25.0%) have expected count less than 5. The minimum expected count is 4.52

16. Chi-Square Tests: purchase seeds and farming classifications

traditional	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	8.415(b)	1	.004		
Continuity Correction(a)	1.627	1	.202		
Likelihood Ratio	4.592	1	.032		
Fisher's Exact Test				.108	.108
Linear-by-Linear Association	8.286	1	.004		
N of Valid Cases	65				

mixed	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	13.662(b)	1	.000		
Continuity Correction(a)	8.675	1	.003		
Likelihood Ratio	8.294	1	.004		
Fisher's Exact Test				.007	.007
Linear-by-Linear Association	13.452	1	.000		
N of Valid Cases	65				

modern	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	3.502(b)	1	.061		
Continuity Correction(a)	1.393	1	.238		
Likelihood Ratio	2.533	1	.111		
Fisher's Exact Test				.122	.122
Linear-by-Linear Association	3.448	1	.063		
N of Valid Cases	65				

a 2 cells (50.0%) have expected count less than 5. The minimum expected count is .11
a 2 cells (50.0%) have expected count less than 5. The minimum expected count is .54
a 1 cells (25.0%) have expected count less than 5. The minimum expected count is .65

17. Chi-Square Tests: perceive expensive and farming classifications

traditional	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	8.415(b)	1	.004		
Continuity Correction(a)	1.627	1	.202		
Likelihood Ratio	4.592	1	.032		
Fisher's Exact Test				.108	.108
Linear-by-Linear Association	8.286	1	.004		
N of Valid Cases	65				

mixed	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	13.662(b)	1	.000		
Continuity Correction(a)	8.675	1	.003		
Likelihood Ratio	8.294	1	.004		
Fisher's Exact Test				.007	.007
Linear-by-Linear Association	13.452	1	.000		
N of Valid Cases	65				

modern	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	3.502(b)	1	.061		
Continuity Correction(a)	1.393	1	.238		
Likelihood Ratio	2.533	1	.111		
Fisher's Exact Test				.122	.122
Linear-by-Linear Association	3.448	1	.063		
N of Valid Cases	65				

a 2 cells (50.0%) have expected count less than 5. The minimum expected count is .11
a 2 cells (50.0%) have expected count less than 5. The minimum expected count is .54
a 3 cells (25.0%) have expected count less than 5. The minimum expected count is .65

18. Chi-Square Tests: labour intensiveness and farming classifications

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	.520(b)	1	.471		
Continuity Correction(a)	.000	1	1.000		
Likelihood Ratio	.834	1	.361		
Fisher's Exact Test				1.000	.662
Linear-by-Linear Association	.512	1	.474		
N of Valid Cases	65				

mixed	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	.464(b)	1	.496		
Continuity Correction(a)	.036	1	.850		
Likelihood Ratio	.504	1	.478		
Fisher's Exact Test				.655	.445
Linear-by-Linear Association	.457	1	.499		
N of Valid Cases	65				

modern	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	.001(b)	1	.978		
Continuity Correction(a)	.000	1	1.000		
Likelihood Ratio	.001	1	.978		
Fisher's Exact Test				1.000	.675
Linear-by-Linear Association	.001	1	.978		
N of Valid Cases	65				

a 2cells (50.0%) have expected count less than 5. The minimum expected count is .34
a 2cells (50.0%) have expected count less than 5. The minimum expected count is 1.69
a 2 cells (50.0%) have expected count less than 5. The minimum expected count is 2.03

19. Chi-Square Tests: labour intensiveness and gender

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	.222(b)	1	.638		
Continuity Correction(a)	.023	1	.879		
Likelihood Ratio	.226	1	.634		
Fisher's Exact Test				.757	.448
Linear-by-Linear Association	.218	1	.640		
N of Valid Cases	65				

a 1 cells (25.0%) have expected count less than 5. The minimum expected count is 4.74

APPENDIX D: CONSTITUTION OF EFO

CONSTITUTION OF EZEMVELO FARMERS ORGANISATION

Name of organisation: Ezemvelo Farmers Organisation (EFO)
Established: 04 February 2001
Physical address: Ogagwini location at Embo Traditional Authority
Postal address: P.O. Box 35198, Umbumbulu 4105, KZN, SOUTH AFRICA

A. Objectives:

1. To co-operate with the South African Department of Agriculture, at all levels, and any other institution or person in sustainable, productive, stable and equitable agriculture.
2. To practise organic farming as understood to be: A production system that sustains agricultural production by avoiding or largely excluding synthetic fertilisers and pesticides. Whenever possible, external resources, are replaced by internal (solar or wind energy, biological disease and pest control, biologically fixed nitrogen and other nutrients released from organic matter or soil reserves) resources found on or near the farm.
3. To commercialise our produce in a manner that improves our economic development without compromising our cultural integrity.

B. The General Membership

1. Opened to all adult and youth residents of Umbumbulu who accept to abide by the objectives of EFO.
2. Shall be obtained by applying in writing (Annex 1) through an Internal Approval Committee (see D below) and R10 membership fee is payable at the time of application. The application fee is refundable on non-admission, but not refundable on withdrawal after admission has been confirmed.
3. An ordinary member shall vote once.
4. Membership shall be renewed every year.

C. The Executive Committee and its duties

1. Shall be democratically elected once a year by the general membership from among them.
2. Shall convene general meetings once a month. The Executive committee will also convene executive committee, internal committee and other meetings that may be necessary before the general meeting.
3. The **Chairman** of the executive committee shall convene and chair all meetings. S/he will vote twice in a case of even votes.
4. The **Deputy-Chairman** shall act as a Chairman in the absence of Chairman and on request from the Chairman, where necessary.
5. The **Secretary** shall record the minutes of all meetings and write letters on behalf of the EFO.

6. The **Deputy-Secretary** shall act as the Secretary in the absence of the Secretary and on request from the Chairman, where necessary.
7. The **Treasurer** shall keep a record of and report on financial statements. The Chairman shall act as a Treasurer in the absence of the Treasurer, except where the Treasure's signature is compulsory. The EFO bank account shall be opened in the name of the organisation (EFO) and the Chairman, the Secretary and the Treasurer shall, jointly or severally have signing powers in all transactions on the bank account.
8. An **Additional member** of the executive committee shall perform special duties as agreed upon by the executive committee or by the Chairman, in consultation with the committee.
9. At least four members of the Executive committee shall be present when executive decisions are taken.
10. Unless an apology/apologies has/have been duly received, any member of the executive who is absent from two consecutive meetings shall lose their executive position.
11. Two-thirds of the voting members shall constitute a majority in any decision taken by EFO.
12. The executive committee is obliged to uphold the EFO constitution and to act as a conduit between EFO and traditional leaders as well as other institutions.
13. The headman (*induna*) of Ogagwini location shall be an *ex-officio* member of the executive committee and act as a conciliator.

D. The Internal Approval Committee and its duties

1. Shall consist of all the members of the Executive committee, all the internal inspectors approved by the general membership and trained appropriately at a recognised institution, the quality control officer, and a representative from Department of Agriculture (*ex-officio*).
2. Shall review membership applications and decide on the sanction process in case of constitutional infringements.
3. The internal inspectors shall act as quality control officers in the absence of the quality control officer.
4. The Internal Approval Committee shall record infringements.
5. A member who does not renew their membership shall automatically lose it.
6. A member who does not conform to the organic farming rules shall be dealt with in accordance with the stipulation of the organic farming certifying body, which may include expulsion.

E. Constitutional amendment

1. The constitution shall be amended in accordance with the requirements of the majority (two-thirds) of voting EFO members.

Annexe 1: Members of Ezemvelo Farmers Organisation

1a. The Executive Committee: year 2006

Name	I.D. numbers of members with signing powers	Specimen signatures of members with signing powers
Mr D. Miya (Chairman)		*
Ms T. Mkhize (Deputy Chairman)		*
Mrs B.B Mkhize (Secretary)		*
Ms B. Mkhize (Deputy Secretary)		
Mr N. Maphumulo (Treasurer)		
Mr T. Mabhida (Additional member)		
Prof. A.T. Modi (Mentor)		

1b. Ordinary members

There are members of the EFO from seven small neighbourhoods of the Umbumbulu district, KwaZulu-Natal. Approximately 70% of the members are women. An updated complete EFO membership list may be attached to the constitution on request and by agreement of the EFO executive committee