AN ASSESSMENT OF ANIMAL DRAUGHT POWER IN AGRICULTURAL PRODUCTION: A CASE OF MATONDO VILLAGE - KALOMO DISTRICT.

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DECLARATION

I, **WEBSTER HAMOONGA**, declare that this report has been composed and compiled by me and that the work has been done by me; that all diagrams and maps have been done by me; that the sources of all materials referred to have been specifically acknowledged; and that this project report has not been previously accepted for any academic award.

Date: 29/10/04 Signature: .....

DEDICATION

It is my desire to dedicate this report to my parents Mr. and Mrs. Hamoonga for their moral and financial support that have seen me to this end. I also dedicate it to my dear sister Racheal for her encouragement and best wishes. Finally, to all my family members and friends. Indeed your support during my university schooling had been outstanding and no words can match it, only God can compensate! Without you, this report would have failed.

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ABSTRACT

The general objective of this study was to make an assessment of the role of animal draught power and the diffusion of donkey farm technology in agricultural production. The focus of the study were the oxen and the donkey owners. The target was to see how donkey farm mechanization is spreading and its effectiveness in agriculture production. The present agriculture production and pre-ECF epidemic period agriculture production were also investigated.

Generally, animal draught power plays a key role in the development of the agricultural sector. This is due to its capability to increase the agriculture productivity. However, animal draught power particularly oxen has been affected by East Coast Fever (ECF) disease resulting in deaths of hundreds of cattle. This has seen a reduction in agricultural productivity and high levels of poverty. Therefore, one potential substitute to oxen has been identified as donkeys. Hence, the donkey farm power is believed to be an alternative farm power that will reduce the country's dependence on cattle that are more vulnerable to many diseases.

Therefore, to carry out this research, the households were chosen randomly and out of the 60 households, 40 households were sampled. Hence, the method used to get this sample was the judgmental or purposive method. This was due to the nature of the village with unstable and mobile household members. As a result, those households which were viewed as typical representative of the sample or researcher's interest were chosen.

The study therefore revealed that the current agriculture production is not as it was before the pre-ECF epidemic period. There is low production due to fewer oxen used in agriculture production. On the other hand, some slight improvement in crop production in Matondo Village has been witnessed although not more than pre- ECF period. This increase in the crop productivity is attributed to a number of people who have adopted the donkey farm mechanization as an alternative farm power. As a result, the adoption of donkey farm mechanization has helped to increase crop productivity of Matondo Village as well as Kalomo District. Therefore, the study revealed that there is a

relationship between animal draught power and agriculture production. This means, households with animal draught power have the capacity to produce enough with some surplus for both home consumption and for sale. Further, it was found that the recent recovery in agriculture production is a result of the recent diffusion of donkey farm technology in Matondo Village. To test these hypothesis to find out whether there is any relationship between the used variables, the Spearmann's Rank Correlation was used.

In addition, the study revealed that although some households have adopted the donkeys, the rate of diffusion is very slow. This is due to its low status in the village. As a result, some measures were suggested by the villagers such as giving donkey loans or capital to buy donkeys, teaching farmers the effectiveness of the donkeys in agriculture production, giving small scale farmers free donkeys and launching of some sensitization campaigns to boost the status of donkeys.

Finally, the study revealed some problems farmers face in the agriculture production. However, more importantly, the study suggested measures that can help to ensure even adoption of the donkeys as an alternative farm power such as linking them to cheaper sources of donkeys.

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ABBREVIATIONS AND ACRONYMS

The following abbreviations and acronyms will be found in this report:

DACO	=	District Agriculture Co-ordinating Officer
ECF	=	East Coast Fever
FAO	=	Food and Agricultural Organization
IUCN	=	International Union for the Conservation of Nature
MACO	=	Ministry of Agriculture and Co-operatives
MAFF	=	Ministry of Agriculture Food and Fisheries
NGOs	=	Non Governmental Organizations.

CHAPTER ONE

INTRODUCTION

1.0 INTRODUCTION

This Chapter considers the following: Background to the study, Statement of the problem, General objective and Specific objectives. It also incorporates the Hypothesis, Rationale of the study and definition of some key concepts. Lastly, the general organization of the report closes this chapter.

1.1 Background to the Study

Animal draught power is among the farm mechanization necessities. This is because of their relatively greater flexibility, lower cost and greater linkages to other sectors of the rural economy. It is therefore, one of the most appropriate farm mechanization strategies for the small-scale rural farmers. Animal draught power has also the potential to increase agricultural production which provides food requirements at both local and national levels compared to hand hoeing cultivation.

In addition, it should be remembered that agriculture has remained a major economic activity and a household food security provider for the majority of Zambian families. This is especially so in Southern Province which for a long time held the reputation of being Zambia's grain basket. This is because it was producing more than any other province (Mulonga, 2004). The communities in Southern Province also found pride in livestock ownership which even today, is traditionally used as a measure of one's wealth among the Tonga people. Livestock, particularly cattle, which was at the core of all the agricultural activities in the province, among other commercial purposes, was largely utilized for traction purposes. Cattle also contributed to other economic, social and nutritional aspects, especially in supplementing the diet with proteins through milk and meat among the predominantly Tonga-speaking population of Southern Province (Mulonga, 2004).

Because of this, Kalomo District in particular was amongst the leading maize producing areas of Southern Province. This was actually after the introduction of oxen to the farming system of the province approximately 85 years ago (FAO, 1993). Oxen Draught power then became the norm of land preparation and made hoe cultivation an unknown thing except for weeding in the district. The increased ox-cultivation led to the increased involvement of small-scale producers in market –oriented agriculture and the expansion of agriculture attracted rural development opportunities and reduced unemployment levels. Oxen draught power provided an economically viable method by which small-scale producers overcome the labour constraints to increased output and thereby expand sales and raise their income.

Kalomo district was able to meet the district food basket requirement. The maize production in the district despite the severe drought during the 1991/92 farming season was estimated at 26,700 x 90kg bags, (FAO, 1993). In addition, during the 2002/03 farming season, maize production in the district was estimated at 900,000 x 100 kg bags, (DACO, 2003). This means that in the times of good rainfall and available animal draught power the district could produce more that this. However with the serious epidemic of ECF, production of maize was negatively affected.

In addition, due to poor management of the cattle resources, livestock was almost wiped out of the Kraals after many farmers lost their livestock to outbreaks of contagious diseases. Chief among them was corridor disease, locally referred to as "Denkete" which by the dawn of this millennium had already claimed thousands of cattle in the province, (Mulonga, 2004).

As at 1980, there were 1.1 million animals in the province but statistics now show that by the year 2000, there were about 500,000 animals, (Mulonga, 2004). Because of the effects of ECF, it is now estimated that 50% of plateau/flats households no longer have any oxen or cow strong enough to substitute for them.

Only 30% of households still own draught animals, (FAO, 1993). This shows that only 50% of farmers on the plateau/flats and 30% of the valley/escarpment of Southern Province own oxen, and in most cases only one ox team, rather than several, (FAO, 1993). In the Central and Northern Valley, 30% had draught animals before ECF, but now it is estimated that less than 15% have animal draught power. In 1990, Kalomo District had only 15,000 work oxen, a district of about 167,446 people with 27,368 households. But it should be noted that this figure of oxen was prepared before the present serious cycle of ECF reached its maximum effect, (FAO, 1993). Furthermore, by the year 2002, the total cattle population of Kalomo District was 2,702 which reduced by 32% in 2001 from the previous cattle population of 3,567, (MACO 2002).

As a result, Southern Province is still struggling to replace the lost animals. Because of this, there is insufficient animal draught power to meet the demand. Due to this, the agricultural productivity of the small-scale farmers has suffered a major disruption, contributing to the rise of rural poverty levels in the district as well as the whole province due to low production.

Therefore, the once ~~hive~~ of ox-draught power district is now experiencing a mixture of animal draught power types. The ox-use for ploughing is below (3.4ha) beyond the national average of (3.5 ha) (Mwenya and Dibbits, 1993). It is also 3% and 15% below provincial averages of Luapula and North Western Provinces respectively (Mwenya and Dibbits, 1993). Due to the effects of ECF and lack of ox power, the use of donkey draught power is seen to be leading in both agriculture and in transport. Thus today, the district has considered use of donkeys from Siameja (Sinazongwe). Donkeys are seen to be an alternative to oxen power due to their immunity to diseases. Hence, Siameja center has been encouraging the diffusion of donkeys to other places in the valley and plateau in which Kalomo district have benefited. Therefore, whatever the basis of animal draught power, it remains essentially beneficial to Matondo Village in times of

adversity. Hence, the use of donkey draught power is likely to be a better approach to cultivation than the use of hoes only.

1.2 Statement of the Problem

The present rural context in Matondo Village is that of deteriorating health, increasing poverty and low agricultural production. There is also continued cattle population decline due to ECF existence. Because of this, there is continued lack of oxen draught power leading to increased poverty and deteriorating health. This is ~~contributed~~ due to lack of animal power which have the potential to increase productivity. Thus, this study seeks to assess the diffusion of donkey draught power mechanization and the restoration of oxen draught power in agriculture production among the people of Matondo Village.

1.3 General Objective

The main purpose of this study was to make an assessment of the role of animal draught power and the diffusion of donkey technology for agriculture production.

1.4 Specific Objectives

The following specific objectives were incorporated in the study;

i. To investigate whether the present low agricultural production is due to lack of animal draught power,

ii. To find out how, agriculture production was before cattle were killed by 'corridor' ECF disease and

iii. To investigate the spread (diffusion) of donkey draught technology in Matondo Village.

1.5 Hypothesis

These hypothesis were tested in consideration with the specific objectives.

- There is no significant relationship between animal draught power and agriculture production in Matondo village
- Recovery in agricultural production is not significantly a result of the recent diffusion/adoption of donkey draught power.

You needed more hypotheses!

1.6 Rationale

The study was concerned with an assessment of animal draught power in agricultural production. This is an important study for it will give an insight on the role and effectiveness of animal draught power in agriculture production in Matondo Village. It would also provide an appreciation of the role of donkeys as an alternative farm power in the study area and elsewhere in increasing agriculture production (of maize) to combat hunger and poverty at both national and local levels. This will then help the Government and NGOs on their re-stocking exercise to beef up cattle numbers and donkey introduction in the country. On the other hand, problems faced by farmers in Matondo Village concerning cattle diseases will be highlighted. Hence, the highlighted problems together with some suggested solutions will help the Government and other stakeholders such as NGOs to plan effectively on how to address livestock problems. Therefore, appropriate measures would be taken to beef up cattle numbers and increase the rate of donkey adoption to revamp the dwindling status of Matondo Village in terms of food production to ensure sustainable food security for all.

1.7 Definition of some key terms used in this study

i. **Animal draught power** – is in this study used to refer to the use of animals for weeding, transporting, ploughing and planting.

ii. **Donkey adoption** – is in this study used to refer to the acquisition of donkeys by farmers as an alternative farm mechanization power to increase food production by all.

iii. **Agriculture production** – is, in this study, used to refer to increase in maize production at both household and national levels to provide food security.

1.8 Organisation of the Report

This report is divided into seven chapters. The First Chapter gives the background to the study. It has been done by highlighting the following: background to the study, statement of the problem, general objective, specific

objectives, the hypothesis, rationale and the definition of some key concepts used in this study.

The Second Chapter provides a more comprehensive background to the study by reviewing the available literature related to the field of study. This is done by looking at the general role of animal draught power at world level followed by the African situation. The Zambian situation close this chapter.

Chapter three looks at the description of the study area. This chapter reviews the climate, relief and soils of Kalomo district. It is followed by land tenure system in the district and the main economic activities of the district such as occupation. Finally, types of farmers found in the district and current changes in agriculture in Matondo Village.

Chapter Four considers the methodology used in the study. This is done by looking first at the sources of data used. The sampling method used, the manner in which the data was analysed and presented and the limitations incurred during the research are also incorporated.

Chapter Five consists of Research Findings. The sections covered under this chapter are: characteristics of the sample, length of stay in Matondo, origin of donkey farm mechanization and the number of households with donkeys. It is followed by the years donkeys were bought and the status of the donkeys in Matondo Village. The chapter also incorporates the adoption of donkey farm mechanization, diffusion of donkey farm mechanization, the agriculture production of Matondo Village and the performance of donkeys in agriculture production.

Finally, the current agriculture production, some measures of supplementing household food needs and measures by which donkey farm mechanization can be boosted in the village are also covered in this chapter.

Chapter Six looks at the discussion of the findings. This chapter considers the following; the relationship between animal draught power and agriculture production, the influence of Veterinary Assistants and Camp Officers and Care International Zambia. It also looks at agricultural production and the recent diffusion/adoption of the donkey draught power.

Finally, Chapter Seven gives the conclusions of the findings as well as recommendations for future planning and research related to animal draught power.

CHAPTER TWO
LITERATURE REVIEW

2.0 Animal Draught Power World Profile

According to FAO (2001), about 250 to 300 million animals are used for work in agriculture and transport worldwide. The World Cattle Population is estimated at 1,000 million while World Donkey population is about 40 million (Payne : 1994). These provide animal power which is of enormous importance throughout Asia, South America and Africa. They are therefore seen as a fundamental requirement for survival, well-being and socio-economic development of all humanity. Because of this, they are used for draught work or transport, (Crossley and Kilgour, 1983).

These draught animals are of a wide variety which include cattle, buffaloes, donkeys, mules, horses, camels and elephants. They provide the means by which millions of families make a living, contribute to the establishment of ecologically and socially acceptable production. As a result, the use of draught animals help to raise the living standards of the rural communities (Starkey, 1996). For instance, a healthy ox has a typical working speed (m/s) of 0.9 and 6 working hours per day. While the donkey has a typical working speed (m/s) of 1.0 and 4 working hours per day, (Crossley and Kilgour, 1983). Furthermore, the working speed of most draught animals when working at optimum pull is about 1 m/s. Because of these factors, the animal draught power is capable of meeting the household and national level food requirements.

In addition, large and very complex agro-industrial estates have recognized that, in appropriate situations, the use of animal power is economically justified. For instance, in the Caribbean, on one of the largest sugar plantations in the world, animals and machines have been used together effectively and continuously over the last 75 years. In 1994, more than 8,000 oxen were employed continuously for six to seven months in transporting one-third of the sugarcane harvest, (FAO,

1996). It is therefore argued that, as long as large and complex agro-industrial estates and some farming equipment power remains expensive and inaccessible to small scale farmers, the world profile of animal draught power will remain the most appropriate farm mechanization power world wide (Crossley and Kilgour, 1983).

2.1 African Situation

According to Starkey (1996), ox-draught power is the main source of farm mechanization in Africa. These draught animals are used in a number of activities such as agriculture, transport, weeding and planting. In Gambia since 1955, extension workers have been encouraging the use of ox power in agriculture production. Hence, the use of oxen has dominated over the other animal draught power in the whole country (Starkey, 1996). This is because it is hard, strong and easy to feed, simple to harness and the yoke is made locally at a low cost, and at the end of its working life, it may be sold for meat. It also works slowly but unflaggingly.

In Malawi, animal draught power is also used in a number of activities. The common animals used in Malawi are oxen and donkeys. About 95% of the work animals are found in the Northern Region and most of the donkeys are presently in the Central Region (Chenje, 2001). However, there are few draught animals in the Southern Region. Donkeys are generally used only for transport and in pairs, they are generally used for light ploughing although tire more easily than oxen, (Chenje, 2001).

Oxen and donkeys have been used for many years in Mozambique for draught power, mainly for pulling wagons and ploughs. In the Zambezi Basin, animal power is used in the Manica Province. While in Central Senegal after the campaign was organized to use donkeys, the number used as plough animals increased from 25,000 to 56,000 heads between 1969 and 1978 (Payne, 1994).

In addition, in Zimbabwe, the majority of communal farmers use oxen as a basic source of traction for clearing land, ploughing, cultivating and in farm transportation. Donkeys are also used in some dry marginal lands, usually to supplement ox power. The use of animal drawn implements is preferred in rural communities because of its relatively greater flexibility, low cost and greater linkages to other sectors of the rural economy (Chenje, 2001). These draught animals with their preferred drawn implements had been the major source of farm power responsible for the provision of household food security. The cattle total African population is estimated to be around 15,161,000 while for the donkeys is around 11,950,000 (Payne, 1994).

However, the survival of small-scale farmers under this system of cattle rearing has not been easy. It demands them to make rational and intelligent decisions in the difficult circumstances they face. These range from low income, little economic power, expensive agriculture inputs, political dimension constraints and more importantly diseases; trypanosomiasis and ECF, (FAO, 2002). In many places, the development of the integrated crop production system had been prevented. This means tilling is performed by hands and agricultural productivity is lower than when healthy animals were available to provide draught power. For instance, according to FAO (2000), in Ethiopia, a team of oxen in a diseased area can only cultivate 60% of the required food. Furthermore, Inns (1990) argues that although animal draught power is a common form of farm mechanization for small-scale farmers in Africa, particularly south of the Sahara, it is limited while the potential is correspondingly greater. In addition, FAO (2002), argues that Sub-Saharan Africa has a total cattle stock of 196 196, but 46,343 cattle are at risk of dying while 90,743 cattle are not kept owing to ECF and Trypanosomiasis.

Because of this problem, a number of countries in Africa have switched on to the use of donkeys as draught animals which have a strong immune system, (FAO, 2002). The donkey is seen to be a friendly, handy and a quiet animal. It is also patient when working (Crossley and Kilgour, 1983). Therefore, small scale

farmers have resorted to adopting the donkeys. Donkeys are used both in agriculture and transport. For instance, the extension officers in Gambia after introducing oxen to agriculture between 1955 and 1975, switched off to donkey use such that in 1988 more donkeys were being used in agriculture production than oxen, (FAO, 2001). This is because the donkeys were seen to be inexpensive animals that offer more timely cultivation. Gambia has currently two formal extension schemes helping farmers with the adoption of intensive donkey use, (FAO, 2001). Donkeys are further used in Mali for transport and agricultural production. They are also used in Botswana in Kanya District. This district has also a rural industry innovation center where equipment for donkeys are made. Furthermore, donkeys are used in Malawi, Mozambique and Zimbabwe in the Zambezi Basin of Manica Province (Chenje, 2001). In North Africa, donkeys are used for transport loading.

Therefore, in view of the above and the high risk of cattle, it is important that the donkey draught power is introduced so as to fend off the adversity the small scale farmers are facing. There is need for encouraging small-scale farmers in Africa to adopt donkeys as an alternative farm power.

2.2 The Zambian Situation

According to FAO (1993), oxen were introduced to the farming system of Southern Province approximately 85 years ago. This then made oxen the norm of land preparation. However, it was not in southern province alone where oxen were introduced into the farming system, but Zambia as a whole. The introduction of oxen into the farming system made oxen the leading farm mechanization in the country with the national average use of oxen of about 3.5 hectares. Furthermore, for southern province, oxen use before ECF had been 3.4 hectares, (FAO, 1993). This made the southern region of Zambia, one of the food baskets of Zambia in terms of Maize Production for it was producing more than any other region (Mulonga, 2004). In addition, the introduction of oxen made agriculture the major economic activity and a household food security for the

majority of Zambian families for they were at the core of all agricultural activities in the country (Mulonga, 2004).

However, due to poor management of this resource, southern province and other parts of Zambia have lost their livestock to outbreaks of contagious diseases. Chief among them was corridor disease, locally referred to as "denkete" which by the dawn of this millennium had already claimed thousands of cattle (Mulonga, 2004). Corridor disease in Southern Province started around 1984 because of the absence of a cordon line to restrict livestock movement. Hence, as in 1980, there were 1.1 million animals in the province. But statistics currently shows that by the year 2000, there were only 500,000 animals (Mulonga, 2004). Furthermore, according to FAO (1993), it is now estimated that only 50% of the farmers on the plateau/flats and 30% on the valley/escarpment of Southern Province own oxen. In most cases, these people own only one ox team, rather than several. Kalomo district as in 1990 had only 15,000 work oxen. Because of this, there is insufficient animal draught power to meet the demand.

Therefore, Southern Province, particularly Kalomo district, the once hive of ox-draught power district is experiencing a mixture of animal draught power types. There is now use of donkey draught power both in agriculture and transport. Hence, the introduction of donkeys in the farming system is aimed at supplementing farm power mechanization to some families that had cattle. As a result, to encourage this farm mechanization, a donkey center ~~had been~~ was set up at Siameja in Sinazongwe district to train farmers' donkey use. In addition, farmers are being trained and taken for training at Palabana in Donkey Traction, (DACO, 2003). This is done in order to encourage the diffusion of donkeys so that people with few cattle or without cattle can adopt this alternative farm technology which is better than hand hoeing. Furthermore, the state has moved in to beef up cattle population in the province. For instance, the Government with the assistance of donors such as the Japanese International Co-operation Agency (JICA) under the restocking programme has earmarked 335 dip tanks for rehabilitation this year

2004 to boost disease control, (Mulonga, 2004). This exercise is aimed at combating ECF disease to beef up cattle population. Therefore, it is viewed that once the cattle-restocking programme succeeds and people adopt donkey farm power, it will in no doubt, lead to economic rejuvenation in Matondo Village and the province as a whole.

A satisfactory literature review though marred with grammatical and spelling errors.

CHAPTER THREE

3.0 DESCRIPTION OF THE STUDY AREA

3.1 Introduction

This chapter discusses the study area by looking at some of the facts on location, climate, relief, soils, land tenure system and socio-economic activities of the study area.

3.2 Location

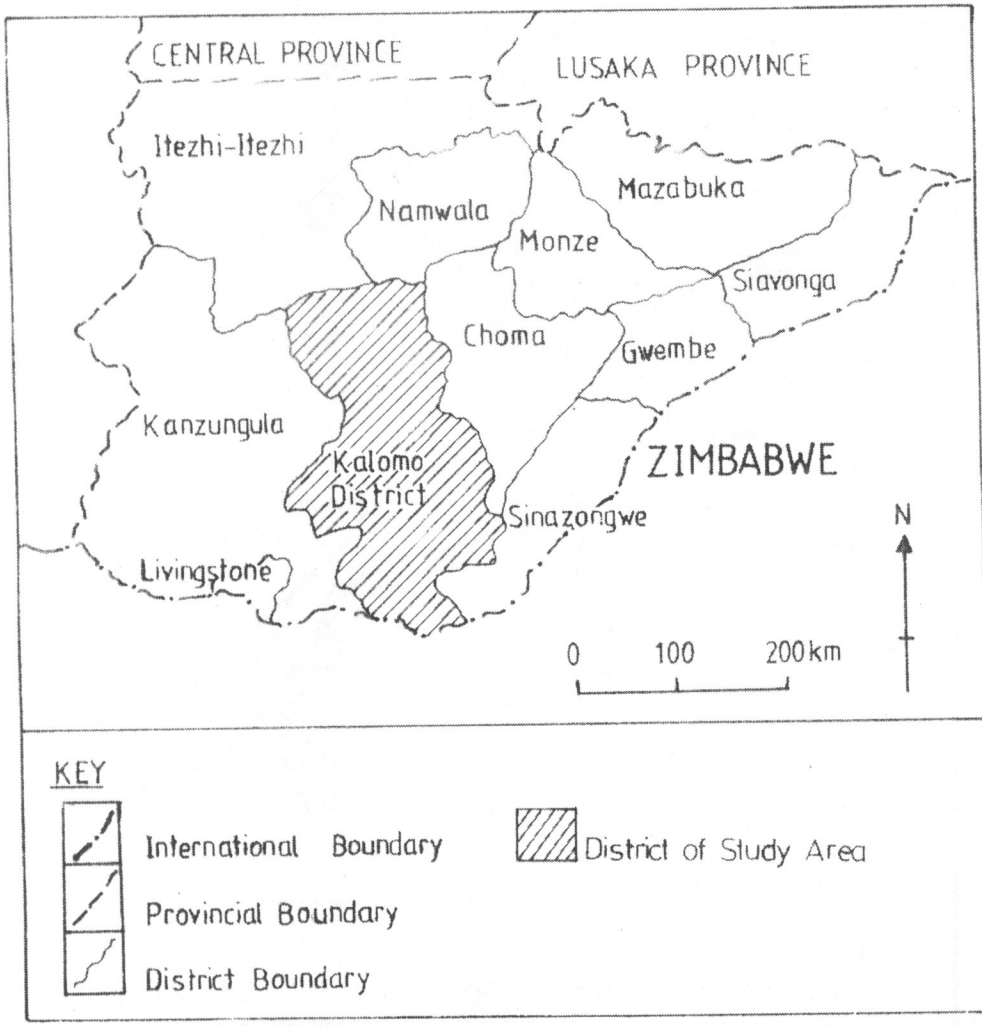
Kalomo district is situated along the Great North Road about 120 km north of Livingstone town and 400 km south of Lusaka. Its location in Southern Province is shown in (fig.1). The district has a total surface area of 15,000 km^2 and a population of 167,446 people with 27,368 households. It is in this district where Matondo Village, the study area is located. It is located to the west of Kalomo town as shown in (fig. 2). It is some 10 to 15 kilometres from the town center. The village has 60 households of the Tonga, Toka-leya and Lozi ethnic groups. The village had been once the Lozi administrative center where the captured animals and goods were kept before taken to the lozi kingdom. The village now occupies a large area including the once state land of Chikoli Ranch known as "Makkala Nguzu".

3.3 Climate

Matondo Village is situated in an area which has three different seasons with a sub-tropical climate. The different seasons are as follows; cold dry season, the hot dry season and the hot wet season. Since the village is on the plateau, it receives an annual rainfall of between 800 – 1000 mm. The rain season extends from mid-November to the end of March. The village receives a variation in the amount of the rain with a single peak experienced mainly in December. These variations are in the patterns of rainfall within a season and between seasons, (Bunyolo et al, 1995). However, the rainfall is enough for agriculture activities.

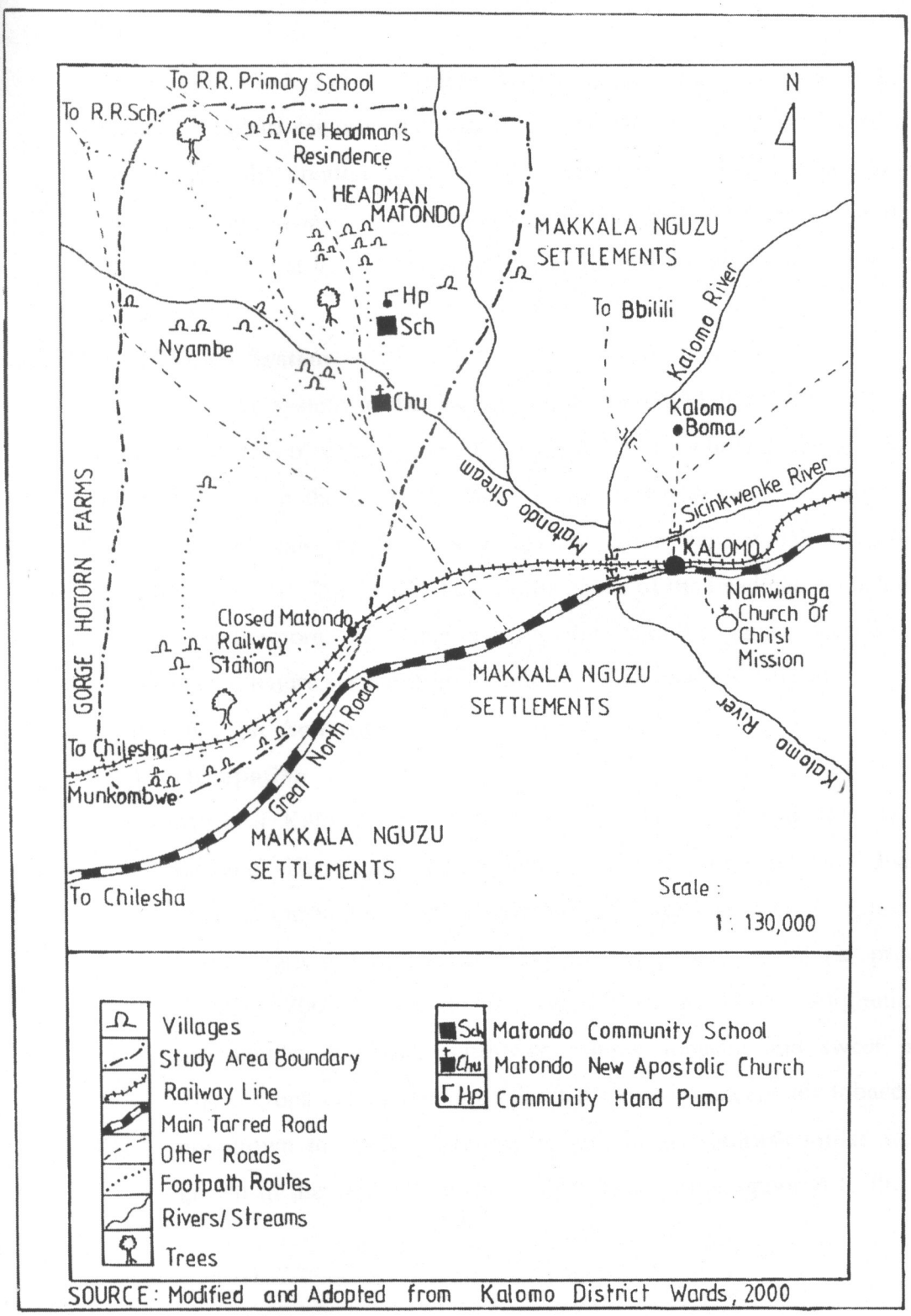
FIG. 1 LOCATION OF KALOMO DISTRICT IN SOUTHERN PROVINCE.

Locate this area ~~with~~ on the Zambian map first.



SOURCE: Kalomo District Planning Unit.

FIG.2. DETAILED DRAWING OF THE STUDY AREA – MATONDO VILLAGE.



SOURCE: Modified and Adopted from Kalomo District Wards, 2000

3.4 Relief

Kalomo district is generally a plateau with some patches consisting of a valley. However, Matondo village is a plateau. It is located at 1 300 metres above sea level.

3.5 Soils

According to FAO (1993), Kalomo district in general has sandy loam soils with scattered Kalahari sands in the northern parts. There are also scattered dambos, which usually dry up after the rainy season. However, Matondo village consists of Acrisol, a sandy loam and sand soils which are "sandveldt" soils, a predominant soil type in the district. These soils are fertile and are potentially good for crop production.

3.6 Land Tenure System

The land tenure system in the district is both leasehold and traditional leasehold (consists of farms of various sizes and scattered in the whole district). The largest portion of land in the district is held under the traditional land tenure system. Therefore, Matondo village has a land tenure system which is held under traditional system. The land is held in the hands of the headman on behalf of the people. Furthermore, the village was an administrative center. Because of this, changing land tenure system from traditional to leasehold is difficult.

3.7 Socio-economic Activities

3.7.1 Occupation

Most of Kalomo district as well as Matondo inhabitants depend on farming. Hence, agriculture is the main economic stay of the district and 95% of the households depend on agriculture for their livelihood. The major agricultural activities include crop and livestock production, (DACO, 2003). The major crops grown are maize, sorghum, millet, groundnuts, cowpeas, sunflower, cotton, tobacco and sweet potatoes. These crops are grown throughout the district except for tobacco that is not grown in chinkoyo block. Sorghum and bulrush millet are widely grown in the valley (Kanchele and Chinkoyo) as opposed to the plateau.

Therefore, since Matondo village is on the plateau, the crops that are grown on the plateau in the district are also grown in Matondo Village.

3.7.2 Types of Farmers

There are two types of farmers in Kalomo district. These are commercial and subsistence farmers. However, in Matondo Village, there are only subsistence farmers. These farmers use oxen, donkeys and hand hoes while the commercial farmers mainly use tractors. It should also be noted that only 151 commercial farmers with 219,159 hectares of land are in Kalomo district while the majority are ~~the~~ medium and small-scale farmers.

3.8 Current changes in Agriculture

A number of changes can be observed in the agriculture system in Matondo Village. The major changes is the adoption of donkeys as an alternative farm power. There is also adoption of pot-hoeing farming which is a form of soil conservation method taught by Care International Zambia. Due to these changes, there is some improvements in terms of household food security in the village.

Good – Check your unstandardised type setting system.

CHAPTER FOUR
METHODOLOGY

4.0 Introduction

This chapter looks at the sources of data, data collection methods, sample size and sampling procedure, data analysis and presentation and problems encountered during the research.

4.1 Sources of Data

There are two sources of data that were used in this project. These are primary and secondary sources. Therefore, since the project was done in a rural area where people have low education background, questionnaires were administered in direct contact with the respondents. In addition, secondary data sources were got from the libraries.

4.1.1 Primary Data Sources

The primary data sources targeted three groups of people. These are the District Agriculture Co-ordinating Officer, the Veterinary Officials and the residents of Matondo Village. The other primary sources of data was direct observation of the agriculture fields by the researcher.

4.1.2.1 Questionnaires

The questionnaires were administered in direct contact with the residents of Matondo Village, (see Appendix 5). The questionnaires covered ~~the~~ issues such as current agriculture production, surplus, agriculture production use, number of cattle/donkeys before and after ECF epidemic and how Donkey farm mechanization is spreading in Matondo Village.

4.1.2.2 Interviews

The interviews were conducted ~~to~~ the District Agriculture Co-ordinating Officer of Kalomo District, the District Agriculture Production Manager and the Senior Agricultural Officer, (See Appendix 6). The information collected included donkey use in agriculture, rate of donkey adoption, strategies put in place to ensure that everyone adopt donkey farm mechanization, current agriculture production of the district and measures

that they have put in place to revamp the dwindling status of the district in agriculture productivity. The other interviews were conducted with the Veterinary Officials and the information collected included, current district cattle population, cattle numbers before ECF in the district, donkey population in Matondo village and measures put in place to ensure that donkeys are in good health always, (see Appendix 7).

4.1.2.3 Observations

Direct observations and investigation of agriculture fields and farm mechanization power was another source of primary data. This included what could be seen and heard. This was so helpful in that a lot of information was collected through mingling with different household members. It helped to get information pertaining their attitude towards the adoption of the donkeys as an alternative farm power, their views on how donkey farm power can be boosted and measures to be undertaken to ensure that many farmers adopt this farm power. This information is important for comparison with data obtained through the questionnaires.

4.1.2 Secondary Data Sources

The Secondary Data Sources ~~involved~~ the review of literature pertaining to the use of animal draught particularly oxen and donkeys in agriculture production. The sources of such literature included the libraries of the University of Zambia and Kalomo ~~Public Library~~. The other sources were written reports on agriculture production from the Ministry of Agriculture Headquarters and Kalomo field survey of the Ministry of Agriculture. Kalomo Veterinary documents were also consulted.

4.2 Sampling frame

A full list of village ~~consisting of all the~~ households in Matondo village was obtained from the Village Headman to know the number of the households in the village. Hence, the total households for Matondo was 60.

4.2.1 Sample Size

A sample size of 40 respondents who are the heads of the households was chosen out of the 60 households. This sample is reasonable because it

exceed the minimum required sample of 30 for any research to be scientifically researchable and it also exceeds 10% of the overall population. The information obtained was generalized for the whole Matondo Village.

4.2.2 Sampling Procedure

The sampling procedure used was a Judgmental or purposive sampling method. This is because this method is suitable considering the nature of the village and mobility of the residents. Therefore, the households that were sampled were those that were seen to be typical representative of the sample.

4.3 Data Analysis and Presentation

The data was analysed qualitatively and quantitatively. The data has been presented using tables, graphs and pie charts.

4.4 Study Limitations

A number of limitations were encountered during data collection. The two major ones are:

i. Time limit

ii. Lack of resources or money

Time was not enough to carry out the research. It was compounded by lack of money which made the research difficult to be carried on effectively. Furthermore, some household heads were not available during the time of research. This forced the researcher to come back to some households more than twice which was time consuming. Some respondents were not so co-operating. Some demanded to be given money before they were interviewed and demanded to be given donkeys immediately during the research period.

CHAPTER FIVE

RESEARCH FINDINGS

5.1 Introduction

This Chapter present the research findings and analysis. The issues covered include the characteristics of the sample, the status of animal draught power in agriculture production, the number of cattle and donkeys present in Matondo Village, the origin of donkey farm mechanization and the places from where donkeys were bought. The other issues are the years the donkeys were bought, how people knew that donkeys could be used in agriculture production and the diffusion of donkey farm mechanization in Matondo village. Finally, the agriculture production of the village is presented with measures to boost donkey farm power diffusion in the whole village. The general performance of donkeys in agriculture production wrap the chapter. The data have been summarized using percentages and absolute figures from which inferences have been made.

5.2 Characteristics of the Sample

The research had a sample size of 40 respondents. Out of the 40 respondents interviewed, 32 (80%) were males and 8 (20%) were females. The sample consisted of an unequal number of males and females. Hence, more males according to the research findings are heading households compared to females.

5.3 Marital Status of the Sample

The respondents in terms of their marital status fell into four groups as shown in Table 1.

Table 1: Marital Status of the Respondents

	No. of respondents	Marital status according to sex				Percentage
		Males	%	Females	%	
Married	32	30	75	2	5	80
Widowed	3	0	0	3	7.5	7.5
Divorced	2	1	2.5	1	2.5	5
Separated	3	1	2.5	2	5	7.5
TOTAL	**40**	**32**	**80**	**8**	**20**	**100**

Source: Field Data

It was further found that out of the 32 (80%) married respondents, 30 (75%) were males while 2 (5%) were females. For the widowed, all the 3 (7.5%) interviewed respondents were females. While for the divorced, 1 (2.5%) was a male and the other 1 (2.5%) was a female. In addition, for the separated, out of the 3 respondents, 2 (2.5%) were females and 1 (2.5%) was a male. Hence, out of the 8 (20%) interviewed female respondents, 6 (15%) were household heads who are either widowed, divorced or separated. While the 2(5%) females respondents were married. This is so because their husbands were not present at home during the time the research was done. The information concerning female headed households is important for it helps to find out whether there is some kind of gender biasness in the acquiring of the farming inputs.

The age ranges of the sample were also investigated. It was found that those between 10 to 19 years were 2(5%), between 20 to 29 years were 2 (5%), 30 to 39 years were 16 (40%) and those above 40 years were 20(50%). Hence, the research findings reviewed that the majority of the respondents engaged in agriculture were aged between 30 to 39 who were 16(40%) and those above 40 years who were 20(50%). This scenario shows that only the aged and a few middle aged respondents are engaged in agriculture activities. While, in the young category majority of them are involved in other ventures such as business. It was further found as shown in Table 2, out of the 40 households heads interviewed, 18 (45%) has primary education, 7 (17.5%) has secondary education, 2 (5%) has Tertiary education and 12 (30%) have never been to school. While 1 (2.5%) never responded to this question. The education levels are important for it will help in analyzing the potentials of the farmers in understanding the usefulness of animal draught power in agriculture use and the Government policies of revamping the agricultural sector. It further helps in seeing how fast farmers adapt to the new technologies.

Table 2: Educational Levels of the household heads

Respondents' Education Levels	Total No of Respondents	Education Attainment By Sex And Percentages				Total Percentages
		Males	Percentage	Females	Percentage	
Primary	18	16	40	2	5	45
Secondary	7	6	15	1	2.5	17.5
Tertiary	2	2	5	0	0	5
Never been to school	12	7	17.5	5	12.5	30
Never answered question	1	1	2.5	-	-	2.5
TOTAL	**40**	**32**	**80**	**8**	**20**	**100**

Source: Field Data

From Table 2, it was further found that out of the 18 (45%) respondents with primary education, 16 (40%) were males and 2 (5%) were females. Those with secondary education, out of the 7 (17.5%), 6(15%) are males while 1 (2.5%) was a female. Concerning Tertiary education, there was no female, all are males who are 2 (5%). There was therefore no female who entered the tertiary level of education. On the other hand, for those who have never been to school, out of the 12 (30%) interviewed respondents, 7 (17.5%) are males and 5 (12.5%) are females. This therefore review that, most of the interviewed respondents who have never been to schools are males than females.

5.4 The Household Size

The household sizes differed from household to household. The household sizes were grouped in class ranges of four, ranging from 0 to 25 and above. It was therefore found that, the household size with class range 0 to 4 were 1 (2.5%), 5 to 9 were 17 (42.5%), 15 to 19 were 6 (15%), 20 to 24 were 3 (7.5%) and above 25 were 3 (7.5%). It was therefore observed that most of the interviewed households had 5 to 9 and 15 to 19 members~~of the family~~. The household size numbers are important for they help in knowing the reasons ~~as to~~ why some families experience hunger. They also help to know whether the food produced is enough to cater for the household food needs. On the other hand, concerning

whether the household heads were once employed, 10 (25%) were once employed while 30 (75%) have never been employed. However, considering the type of employment, 9 (22.5%) had informal type of employment. While 1 (2.5%) responded to had formal type employment with 30 (75 %) never worked in any field of employment. This information shows that most of the respondents never worked in meaningful type of employment apart from informal ones.

5.5 Length of stay in Matondo Village

The length of stay refers to how long the respondents have been living in Matondo Village and is represented according to the number of years respondents has continuously lived in Matondo Village. Therefore, the length of stay of the respondents is shown in Table 3 below.

Table 3: Length of stay in Matondo Village

Length of stay in years	No of respondents	Percentage
0 – 4	4	10
5 – 9	6	15
10 – 14	8	20
15 – 19	7	17.5
20 and above	15	37.5
TOTAL	**40**	**100**

Source: Field Data

Table 3 shows that out of the 40 respondents, 4(10%) have stayed in Matondo Village for the period between 0 to 4 years. 6(15%) have stayed for 5 to 9 years, 8(20%) have spent 10 to 14 years while 7 (17.5%) have spent 15 to 19 years in Matondo Village. Finally those who have spent 20 and above years are 15 (37.5%). Therefore, from the table, it can be deduced that the majority of the interviewed respondents have spent a number of years in Matondo Village. In addition, most of the household heads interviewed have stayed in this village since their birth. For instance, the Vice Headman who was born in 1934 and by (2003) was 67 years old have been living in this village since his birth. Further, most of those who have lived for more than 20 years in Matondo Village are the

members of the ruling class of the Headman and occupy most of the land in the village.

5.6 Land Ownership

The land ownership was considered in terms of how many of the 40 respondents were holders of land titles. This is because looking at the incidence of ECF, it was viewed to be one of the indicators of ECF prevention measures for when people have direct control of the land, they become more responsible for they are directly affected. Furthermore, rights to the land is one way of shifting away from traditional agricultural practices to modern agricultural practices. The research findings therefore reviewed that, none of the 40 respondents was a holder of title deeds for the land they occupy and cultivate. Instead, the land is in the hands of the village headman. In addition, Matondo Village was once an administrative center of the Lozi Kingdom in Southern Province. Hence, the land is recognized to belong and governed by a certain group of people who are aligned to the former ruling class in the village. Because of this, there was no indication of anyone wishing to obtain the title deeds for the village is treated to belong to a certain ruling class who are the real owners of the land and is strictly under the traditional leadership.

5.7 The Status of Animal Draught Power in Agriculture Production in Matondo Village

Matondo village is amongst the many villages in Kalomo district that had been hit by ECF. This disease saw a number of cattle dying and reduced the cattle population in the whole village as well as the district at large. Table 5 below shows the range of cattle in the village people had before ECF, before 1985.

Table 4: The Cattle population people had before ECF Epidemic before 1985

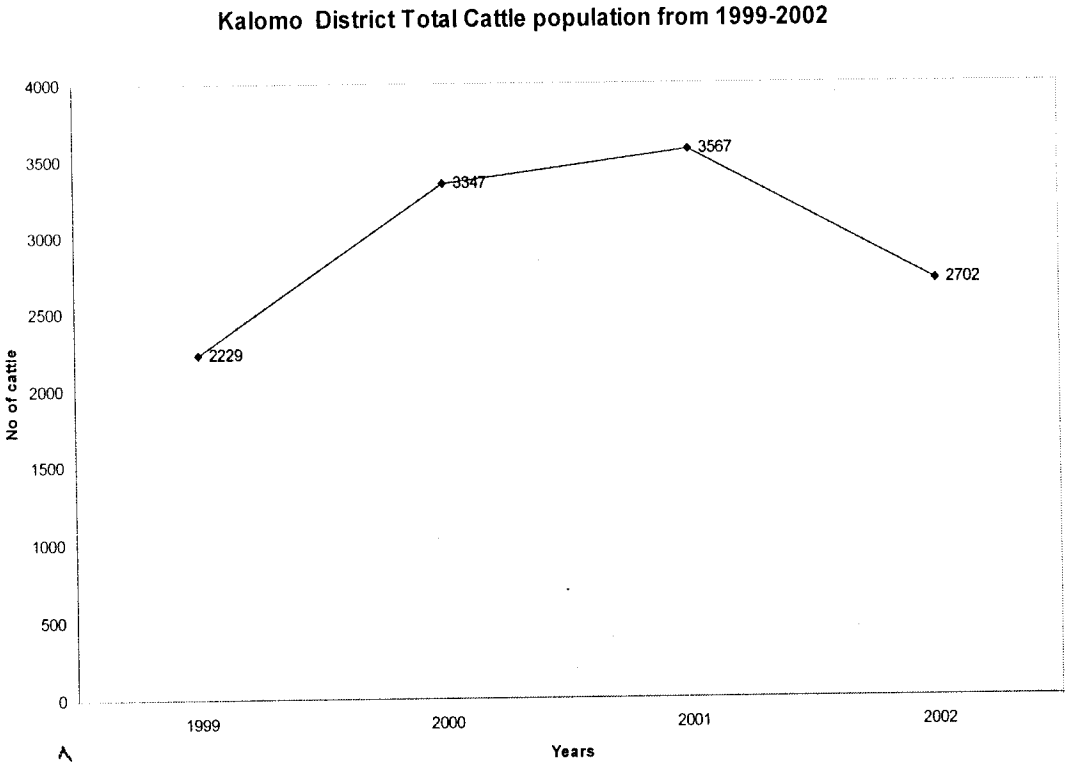
NUMBER OF CATTLE	NO OF RESPONDENTS	PERCENTAGE
0 – 9	13	32.5
10 – 19	10	25
20 – 29	2	5
30 – 39	8	20
40 and above	5	12.5
Nil	2	5
TOTAL	**40**	**100**

Source: Field data

Table 4, shows that of the 40 respondents, the majority 13 (32.5%) had cattle ranging from 0 to 9 before ECF epidemic in 1985. The other respondents 10 (25%) had between 10 to 19 cattle during the same period. In addition, those having cattle between 20 to 29 were 2 (5%). Furthermore, 8 (20%) had 30 to 39 cattle. Finally, 5 (12.5%) had 40 and above cattle with 2 (5%) having no cattle. The majority of the respondents had atleast a pair of oxen for use in agriculture production before the ECF epidemic. Hence, they provided the source of power for agriculture production and a means for household food security, than it is currently. Currently, some household have no cattle and depend on handhoeing.

Furthermore, Kalomo district as a whole, has experienced a decline in the total number of cattle. In 1999, the district had the cattle population of 2,229. In 2000, it had 3,347 cattle, while in the year 2001, it had 3,567. However, in 2002, the cattle population decreased to 2,702 (MACO, 2002). Therefore, these figures shows that ~~in three years~~ from 1999 to 2000, there was an increase in cattle population by 33.40%. While from 2000 to 2001, there was cattle population increase of 6.2%. However, from 2001 to 2002, there was cattle population decrease of 32.0%. thus from 3,567 to 2,702, (MACO, 2002). The changes in the total cattle population is shown in fig 3 below.

Fig 3. Showing Kalomo District total Cattle Population from 1999 to 2002.



Source: MACO (2002)

In addition, according to the research findings, the number of cattle in the village is still declining. This is so due to the continued ECF existence. This is evidenced from cattle deaths witnessed during the time the research was done in January, 2004. Due to this ~~effect,~~ the present number of cattle in Matondo Village is low are as shown ~~below~~ compared to the pre- ECF period.

Table 5. The current number of cattle in Matondo Village

No. Of Cattle	No. Of Respondents	Percentage
0 – 4	16	40
5 – 9	5	12.5
10 – 14	1	2.5
15 and above	8	20
Nil	10	25
TOTAL	40	100

Source: Field Data

Table 5 shows that 16 (40%) out of the 40 respondents currently have 0 to 4 cattle. 5 (12.5%) have 5 to 9 cattle, while 1 (2.5%) have 10 to 14 cattle. Finally, those with 15 and above cattle are 8 (20%) and those without any cattle currently are 10 (25%). However, in terms of real number of cattle, only one person in Matondo village owns 18 cattle.

Most of the respondents have only 0 to 4 cattle with shared pairs of oxen. This scenario therefore shows that the number of cattle in Matondo village is not as it was before the effects of corridor disease. During the pre-ECF period, people had even more than 40 cattle as shown in Table 4 compared to the current figure of 18 cattle of the leading person with 10 (25%) having no cattle.

Nevertheless, despite the declining number of cattle in the village, people still value the cattle more than the donkeys. The cattle have high status in the village and they are acting as a symbol of wealth. Furthermore, people still see cattle as the powerful and strong form of farm mechanization. Hence, the cattle despite there small number still have high status. Because of this, the Veterinary Assistants and camp officers are constantly monitoring the health conditions of the cattle in the village. But they have, however, failed to combat ECF completely although they vaccinate the animals regularly. This is because, ECF still exist in Matondo village as well as the whole Kalomo district. Therefore, because of the continued existence of ECF, a number of cattle had been lost leading to many households having only one pair of oxen and many of them sharing the pairs. Hence, out of the 12 respondents who agreed of using oxen in agriculture, 7 (58.3%) have only one pair of oxen and in most cases shared ones. 4 (33.3%) have two pairs while 1 (8.3%) have three pairs. Therefore, this means that a number of households in Matondo village have only a pair of oxen each. Due to this, a number of people in the village have adopted a new farm technology of donkey farm mechanization to improve their agriculture productivity. But, some farmers are using both donkeys and oxen. Those who use both donkeys and oxen are 10 (25%) in all. However, out of the 10 respondents, 5 (50%) have only one

pair of animal draught each. 3 (30%) households have two pairs of animal draught each and only 1 (10%) household have 4 pairs of animal draught power.

5.7.1 Origin of Donkey Farm Mechanisation

From the research findings, it was found that only 5 (12.5%) of the interviewed respondents had donkeys before ECF epidemic while 35 (87.5%) had no donkeys. However, with the increasing cases of cattle deaths, the number of donkeys are increasing in Matondo village as while as the neighbouring villages. These donkeys were bought from different places as shown in (Fig 4) on page 31. 5 (12.5%) bought the donkeys from Sinazeze before Maamba town, 5 (12.5%) bought the donkeys from the people in the same area. Another 5 (12.5%) bought the donkeys from Siampande, 4 (10%) bought them from Mapatizya while 1 (2.5%) bought the donkeys from kanyanga. On the other hand, 20 (50%) don't have donkeys as shown in the ~~table below.~~

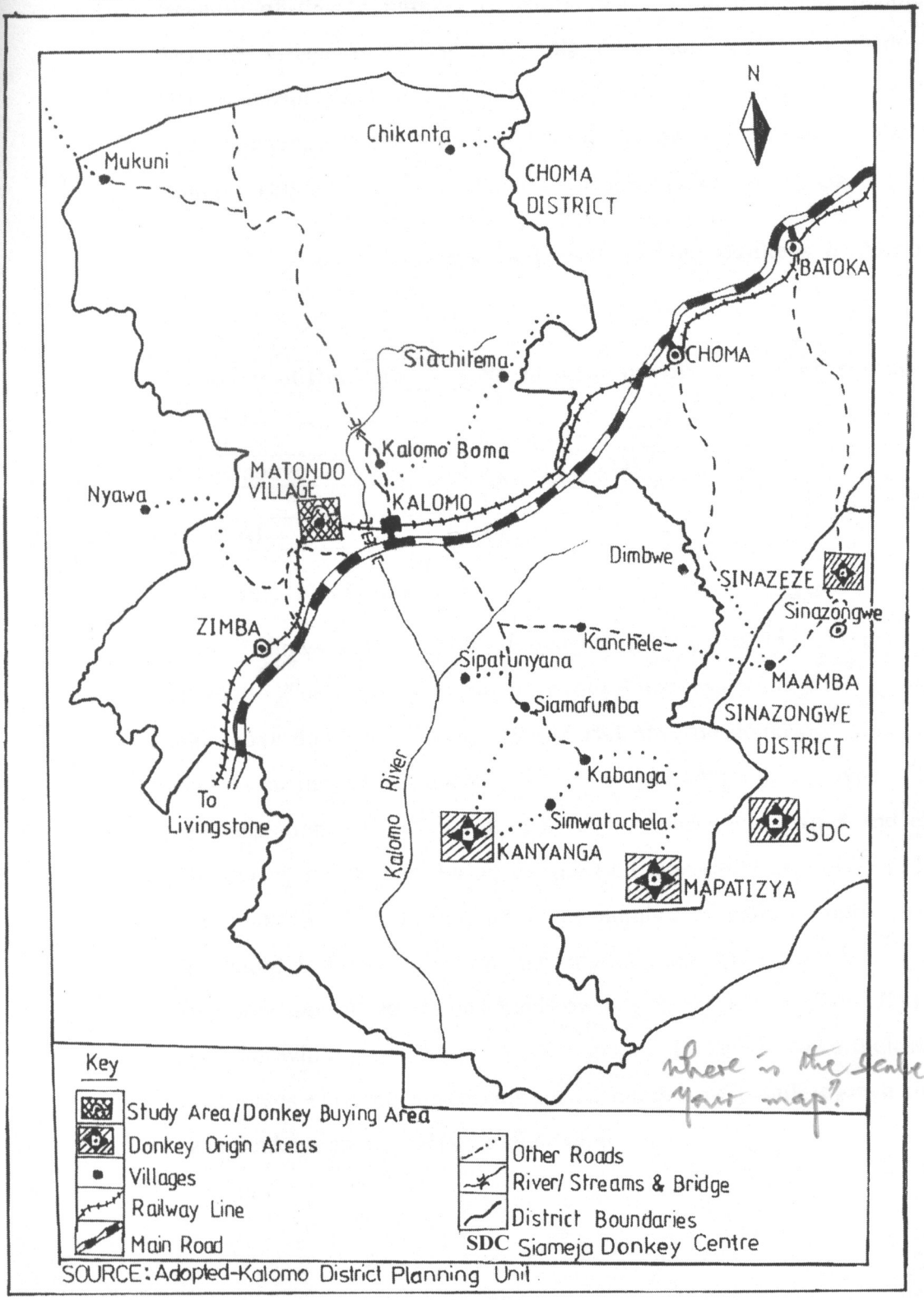
Table 6: Origin of Donkey Farm Mechanisation

Places of Donkey Origin	No. of Respondents	Percentages
Sinazeze	5	12.5
Within the same area	5	12.5
Siampande	5	12.5
Mapatizya	4	10
Kanyanga	1	2.5
No donkeys	20	50
TOTAL	**40**	**100**

Source: Field Data

The information on Table 6 is further shown on the Map (Fig 4) which show the approximate locality of the donkey farm mechanization origins.

FIG.4. APPROXIMATE LOCATION OF DONKEY FARM MECHANISATION ORIGINS.



5.7.2 Household numbers with Donkeys in the Village

The Kalomo district Veterinary Office have failed to combat corridor disease completely in Matondo village as well as the whole district. Because of this, a number of cattle had been lost forcing people of Matondo village as well as other villages in the district to adopt donkey farm mechanization in agriculture production. As a result, there have been an increase in the number of households owning donkeys in Matondo village. This information is shown in the table below.

Table 7: Current number of people owning donkeys in Matondo Village

Number of Donkeys	No. of Respondents	Percentage
0 – 2	7	17.5
3 – 4	6	15
5 and above	8	20
Nil	19	47.5
TOTAL	**40**	**100**

Source: Field data

Table 7 shows that of the 40 respondents interviewed, 7 (17.5%) currently have 0 to 2 donkeys. 6 (15%) have 3 to 4 donkeys while 8 (20%) have 5 and above donkeys. Finally, 19 (47.5%) have no donkeys. This means that there is an increase in the number of people adopting this type of farm mechanization. This is because 8 (20%) households own 5 and above donkeys currently than during the pre-ECF disease when only 5 (12.5%) had donkeys. In addition, when the number of pairs of donkeys each household is considered, the majority of them own only 1 pair each. Therefore, out of the 9 households owning donkeys only, 6 (66.7%) have one pair while 3 (33.3%) have 2 pairs of donkeys. Nevertheless, the situation is currently improving and a number of people though do not have donkeys are appreciating their values.

Furthermore, the research findings reviewed that all the 40 interviewed respondents argued that donkey farm mechanization is the best animal draught power in areas with corridor disease. They attributed this to the resistance of donkeys to diseases and their easy maintanaince in form of vaccination. However, all the people who own donkeys in the village have to look after the donkeys themselves. There is no form of assistance they receive from the Veterinary Officials. On contrary, the Kalomo district veterinary office argued that they regularly treat the donkeys and cattle in Matondo village, but according to the research findings, this is not true. Due to this, the farmers themselves have to bare the responsibility of treating the donkeys to make them healthy every time. There is also no organization formed to teach farmers the adoption of this new farm mechanization technology apart from the Care International Zambia which is teaching farmers the adoption of pot-hoeing planting; a form of conservation tillage farming.

In addition, amongst the interviewed respondents, 2 (5%) knew that donkeys could be used in agriculture from the agriculture extension officers. 19 (47.5%) knew it through people owning donkeys in the village while 2 (5%) knew it on their own due to the problems they faced because of cattle deaths. 17 (42.5%) never responded to this question for some amongst them do not have donkeys. However, some people although they have no donkeys responded of having used the donkeys in transport and in agriculture. Hence, they gave views on the usefulness of these draught animals in agriculture production.

5.7.3 The years donkeys were bought

The people of Matondo village who have the donkeys bought them in different years. ~~The table below~~ shows the different years the donkeys were bought against the number of respondents.

Table 8. The table showing the years Donkeys were bought

Years	No of Respondents	Percentage
1986	2	5
1988	1	2.5
1996	1	2.5
1997	1	2.5
1999	5	12.5
2000	10	25
Not applicable	14	35
Don't know	6	15
TOTAL	**40**	**100**

Source: Field Data

Table 8 ~~above~~ shows that out of the 40 interviewed respondents, 2 (5%) households bought donkeys in 1986. However, in 1999, 5 (12.5%) households bought the donkeys while in 2000, 10 (25%) household bought the donkeys. Therefore, from the table, it can be deduced that after 1999, there was an increase in the number of people buying ~~some~~ donkeys. This is attributed to the continued existence of ECF disease.

In addition, the prices of donkeys varied. Some of the donkeys were bought as pairs while some were bought singly. The prices of donkeys according to the research findings are shown in Table 9 ~~below~~ with the lowest priced pair going at K620,000 in 1986. However, the prices rose especially after 1999 with the highest priced pair going at K1,350,000. Therefore, from the table, it can be deduced that the prices of donkeys were increasing with the increase in their demand.

Table 9 showing various prices of donkey pairs

Cost In Kwacha	Respondents	Percentage
400,000	1	2.5
620,000	2	5
700,000	1	2.5
750,000	1	2.5
800,000	1	2.5
900,000	1	2.5
950,000	4	10
1,040,000	1	2.5
1,200,000	1	2.5
1,250,000	3	7.5
1,350,000	4	10
Not applicable	20	50
TOTAL	**40**	**100**

Source: Field data

5.7.4 The status of the Donkeys in Matondo Village

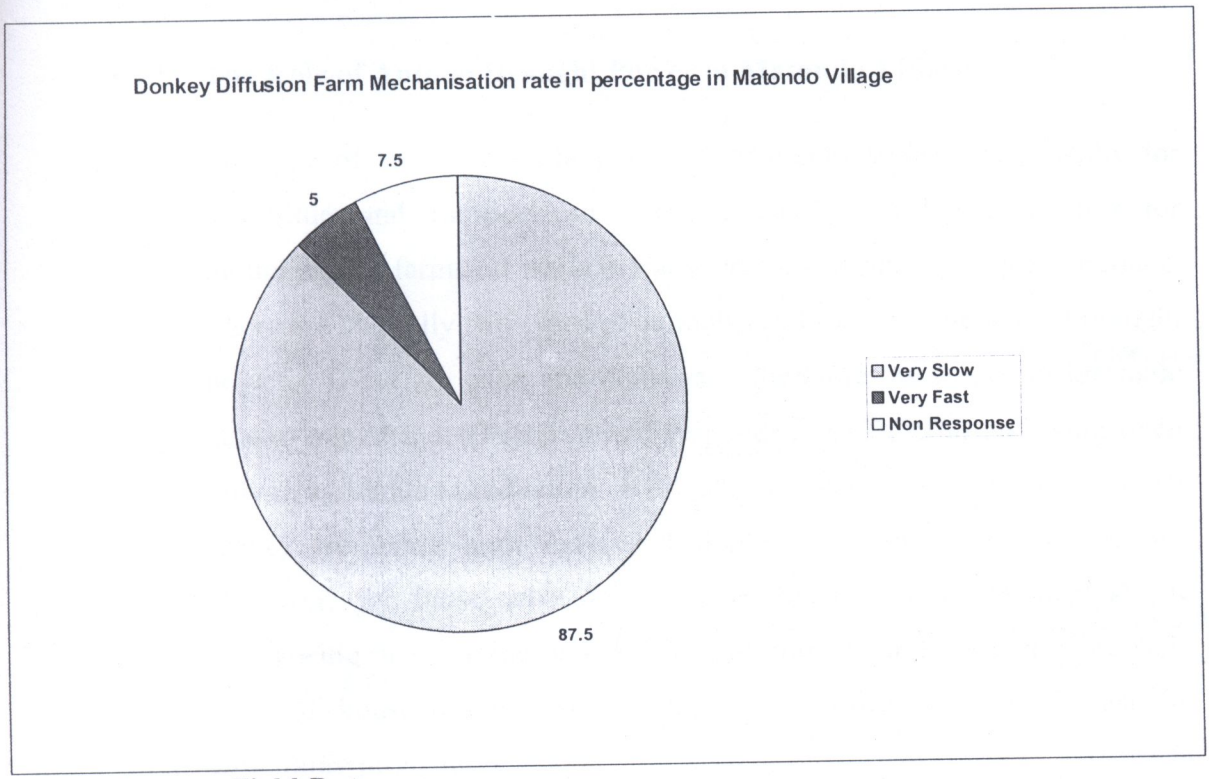
The people of Matondo village have different perceptions towards donkeys. Although a number of them are using donkeys both in transport and agriculture, the people do not give them the high status they deserve. Therefore, the donkey owners in the village are given low status. This is evidenced from the fact that although someone can have more than (5) donkeys, that person still enjoy a low status when compared with a person with only two cattle. Hence, donkey owners in the village do not enjoy that prestigious perceptions as cattle owners. Because of this, a number of people have very negative attitude towards the ownership of the donkeys. As a result, it has affected its rate of adoption in the village as a whole. There are only a few and concentrated number of people with the donkeys.

5.7.5 The adoption rate of donkey farm mechanization in Matondo Village

Although there is an increase in the number of people who have adopted this donkey farm mechanization, the negative perception of the majority of people have affected its rate of adoption. Considering the continued existence of corridor disease and other diseases and the rate at which this

farm mechanization is spreading, it is argued that it is very slow. This is according to what most of the respondents said. Therefore, the Figure below shows the spread rate of this donkey farm mechanization in the village.

Fig. 5 Showing the rate of diffusion of Donkey Farm Mechanisation in Matondo Village



Source: Field Data

From the Pie Chart above, it is shown that only 2 (5%) of the respondents argued that the donkey farm mechanization is spreading very fast in the village. While 35 (87.5%) argued that the spread of this farm mechanization is very slow, with 3 (7.5%) said nothing. But in all, the rate of donkey diffusion in the village is very slow. Hence, something needs to be done to ensure even adoption of this farm mechanization technology. However, the Kalomo field survey department is encouraging the farmers to adopt donkeys as an alternative force on the farm as well as linking farmers to cheaper sources of donkeys. This is aimed at increasing donkey adoption by all farmers in the district.

Nevertheless, despite this slow rate of diffusion of the donkey farm mechanization technology, a number of farmers are willing to adopt the donkeys as an alternative force on the farms. Therefore, in view of this, both the donkeys and oxen are seen as important farm power of agriculture production in Matondo village.

5.8 The Agriculture Production Of Matondo Village

5.8.1 The Role of Animal Draught Power in Matondo Village

The role of animal draught power in Matondo Village is basically for agriculture and transport use. The animals are used in agriculture for ploughing the farmland while in transport for carrying agriculture produce. There are basically two types of animals used that provide animal draught power. These are oxen and donkeys. Therefore, as shown in the table below, out of the 40 interviewed respondents, 12 (30%) are using oxen only in agriculture production. 9 (22.5%) are using donkeys only while 10 (25%) are using both oxen and donkeys in agriculture production. However, for those who do not have oxen or donkeys depend on handhoeing or share the pairs of draught animals and these are 8 (20%). 2.5% (1 household) depend on hired or borrowed animals for use in agriculture production.

Table 10 showing respondents' farm mechanization power.

Farm Power	No. Of Respondents	Percentage
Oxen	12	30
Donkeys	9	22.5
Oxen and Donkeys	10	25
Handhoeing	8	20
Hired/Borrowed animals	1	2.5
TOTAL	**40**	**100**

Source: Field data

5.8.2 The Donkeys performance in Agriculture Production

The people of Matondo village gave different opinions on the performance of donkeys in agriculture production. However, of all the 40 interviewed respondents, all the respondents agreed that the current recovery in agriculture production in Matondo village is as a result of the recent adoption of the donkeys by some farmers. Furthermore, all the 40 respondents argued that lack of oxen in the village is responsible for the present low agriculture production in the whole village which have led to the widespread poverty in the village. Therefore, the table below shows some of the respondents' opinions on the performance of donkeys in agriculture production.

Table 11 showing the Performance of the Donkeys in Agriculture Production

Agriculture Performance	No. Of Respondents	Percentage
Excellent and walk faster than oxen	8	20
Good and do not get hired easily	1	2.5
Better than handhoeing	22	55
Strong and resistance to corridor	6	15
Not stronger than oxen	3	7.5
TOTAL	**40**	**100**

Source: Field data

Table 11 shows that out of the 40 respondents, 8 (20%) argued that donkeys are excellent and walk faster than oxen in agriculture production. 1 (2.5%) argued that donkeys are good and do not get tired easily while 22 (55%) argued that donkeys are better than handhoeing. Finally, 6 (15%) argued that donkeys are strong and resistant to ECF disease. This means, donkeys can be used in agriculture in the areas with corridor disease. However, 3 (7.5%) argued that donkeys although can be used in agriculture production, are not stronger than oxen. Nevertheless, the research findings reviewed that the general performance of donkeys in

agriculture production is excellent especially when compared to handhoeing. This is due to their ability to increase the household food needs than handhoeing.

The information on the performance of the donkeys in agriculture were asked to all the respondents. There was no selection on whether someone has donkeys or not. Hence, both the donkey and oxen owners were asked to give their views on the performance of the donkeys. Therefore, the performance of the donkeys in agriculture production in terms of the number of bags produced which include the surplus is shown in the ~~table below:~~

Table 12 showing the performance of donkey pairs in agriculture production

Donkey Pairs	Total Numober Of Bags Produced Including Some Surplus
2	63
1	80
1	27
1	16
1	25
2	65
2	53
1	17
1	30

Source: Field data

Table 12 shows that the performance of donkey pairs in agriculture production differs in terms of the number of bags produced. Therefore, it can be deduced that donkeys are capable of being used in agriculture production. This is evidenced from the ~~table above~~ which shows the number of bags produced. Hence, a donkey pair is capable of feeding and producing enough for the household need. This is basically the reason why there is some improvement in terms of agriculture production in Matondo Village though not as Pre-ECF period. As a result, a pair of

Village though not as Pre-ECF period. As a result, a pair of donkeys can produce in most cases more than 50 bags as shown in the table above.

5.8.3 The current agriculture production

The current agriculture production in Matondo village is not as high as it was before ECF epidemic period. However, the situation was very bad in the 1990s when the disease was very serious than in the 1980s. Currently, there is some improvement especially with the oxen and donkey owning households. Therefore, the research findings reviewed that currently, 11 (27.5%) households produce 0 to 9 bags. 7 (17.5%) households produce 10 to 19 bags while those producing 20 to 29 bags are 6 (15%). Those producing 30 to 39 bags are 7 (17.5%). Finally, those producing 40 and above bags are 8 (20%). While the household that do not know how many bags it produce is only 1 (2.5%). This information is shown in the table below for the 2001/02 farming season.

Table 13 showing the number of bags produced by the households in 2001/2002 farming season

No. of bags (maize) produced	No. of Respondents	Percentage
0 – 9	11	27.5
10 – 19	7	17.5
20 – 29	6	15
30 – 39	7	17.5
40 and above	8	20
Nil	1	2.5
TOTAL	**40**	**100**

Source: field data

However, during the pre-ECF epidemic period, all the 40 respondents argued that they used to produce more than 50 bags as compared to only 20% who currently produce more than 40 bags but not exceeding 50 bags. This means, during the pre-ECF period, the people of Matondo village used to produce enough for both household consumption and for sale. Hence, the agriculture production rate that time was better than it is

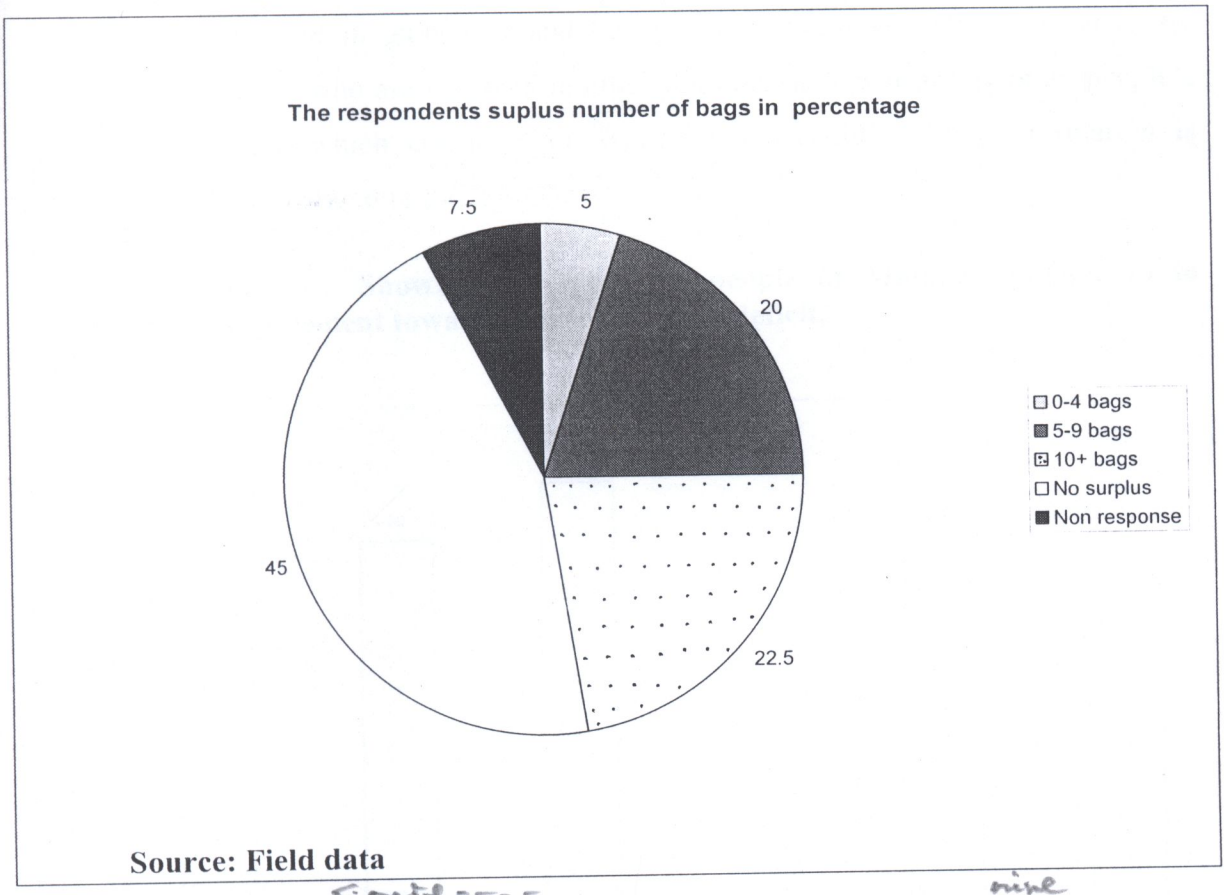
currently. There was also a NAMBOARD depot in the village where bags of maize were stored, but currently this depot is no longer in existence. The factors attributed to its closure are the effects of government policies of liberalization and privatization. It was further affected by low agriculture production in the village due to ECF effects.

In addition, on the district level however, there is an increase in terms of agriculture production. During the 2001/2002 farming season, about 591,374 x 50 bags of maize were produced. The production later increased to 900,000 x 100 kg bags of maize during the 2002/03 farming season, (DACO, 2003). The tables showing the crop production figures from 1999 to 2003 farming seasons for different crops are shown in (Appendix 1; tables 1 – 4) at the end. However, for this research, maize was chosen to be the main target crop because it is the main food crop grown in the village as well as the district. Furthermore, considering the current agriculture production, out of the 40 respondents, 22 (55%) argued that the current agriculture production in the village is enough to meet their household food requirement. But 18 (45%) argued that their current agriculture production is not enough to meet their household food needs. Added to maize, other crops grown are cotton, sweet potatoes, groundnuts, sunflower and cowpeas.

5.8.4 Surplus

During the research, the respondents were also asked about the surplus. The findings reviewed that those who produce the surplus of 0 to 4 bags were 3 (7.5%). Those who do not produce any surplus apart from home consumption and at the same time argued that it was not enough to feed their households are 18 (45%). On the other hand, there are some who did not respond to this question and they are 2 (5%). This information is shown and summarized in the Pie Chart below.

Fig 6. The Pie Chart showing the Respondents Surplus number of bags



Source: Field data

From the Pie Chart, it can be deduced that at least 9(22.5%) of the respondents produce a surplus of 10 and above bags of maize which are sold within the same area.

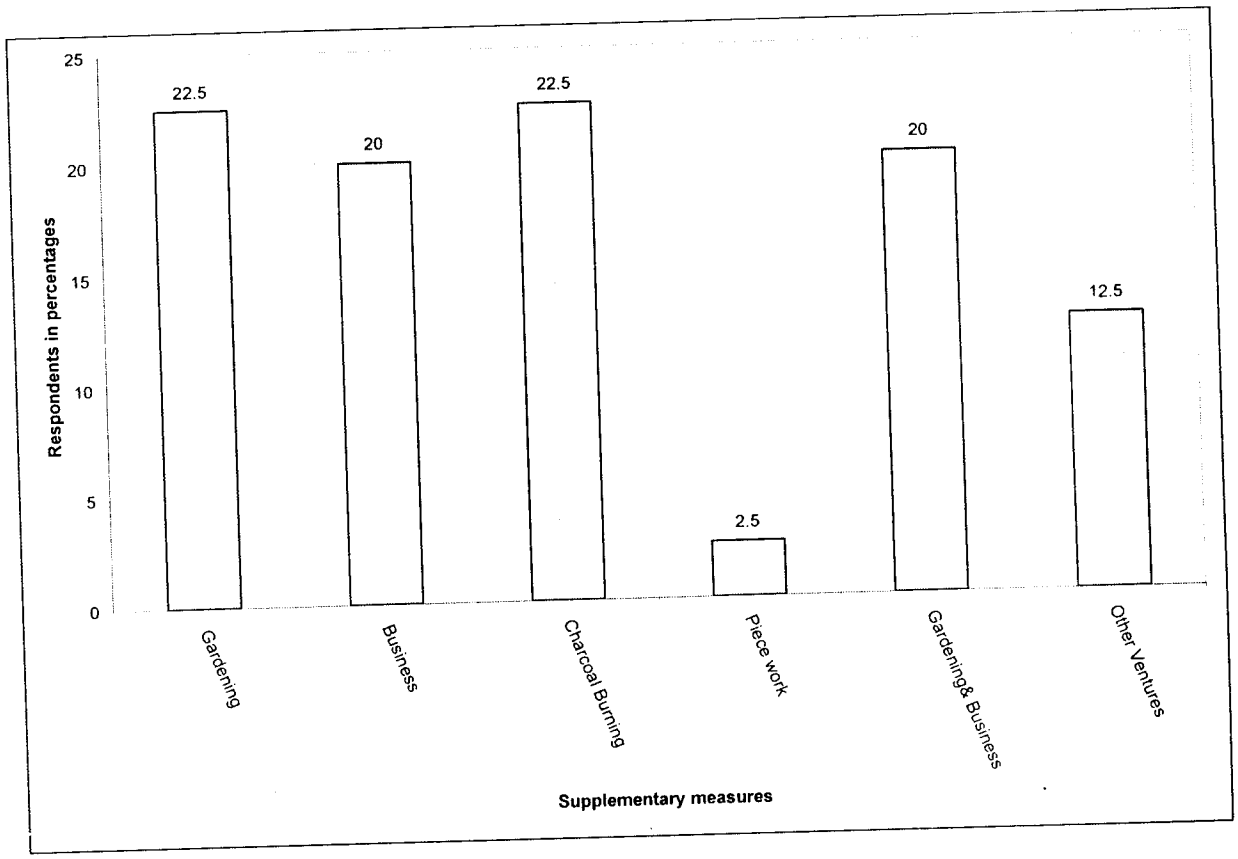
However, despite some farmers producing enough surplus, some of the households in the village fails to do so. As a result, they witness poverty. Therefore, a number of alternatives are done to supplement the household food needs.

5.8.5 Some supplementing measures towards the household food needs

The people of Matondo village do a number of measures to supplement their household food deficit. Therefore, according to the research findings, 9 (22.5%) of the 40 households are engaged in gardening.

8(20%) are engaged in business, while those engaged in charcoal burning are 9(22.5%). 1(2.5% was involved in Piecework activities. Finally, those engaged in gardening and business are 5(12.5%). However, there are others who are involved in other ventures such as hearding other people's cattle which consisted of 5(12.5%) households. This information is summarized in the fig below.

Fig. 7. Showing the measures people of Matondo village do to supplement towards household food deficit.



Source: field data

It can be deduced as shown in Fig 7 that most of the people in matondo village are engaged in gardening and charcoal burning. These activities are done both in the rainy and dry seasons. The charcoal is sold in Kalomo town some 15 km from the village. Business is done by both animal draught owners and those who do not have cattle. Therefore, the

business done is a barter type of business in which the goods are exchanged with things such as chickens, pigs and goats.

Because of some of these supplementing measures towards household food requirements, it means some of the respondents do not produce enough to feed their families. As a result, some respondents argued that some measures need to be put in place so that all the farmers in the village adopt donkey farm mechanization technology as an alternative farm power for most villagers to concentrate on farming.

5.8.6 Measures to boost donkey farm mechanization in Matondo village

There are a number of measures which can be done to boost donkey farm mechanization in Matondo village. Hence, out of the 40 respondents, a total of 14 (35%) of the interviewed respondents suggested that teaching people on the usefulness of donkeys in agriculture could increase the rate of adoption. 6 (15%) argued that donkey loans should be given to farmers while 3 (7.5%) suggested that money should be given to farmers to buy donkeys. 7 (17.5%) argued that the government and the NGOs should help the farmers in any way in terms of donkey adoption and 10 (25%) suggested that farmers should be given free donkeys and be taught how to use them as it is with oxen.

Therefore, when these measures are taken seriously, it will ensure sustainable household food security for all the people. On the other hand, as the Kalomo field survey department suggested, the continued sending of farmers to Palabana to teach them on donkey traction, encourage crop diversification and linking farmers to cheaper sources of donkeys should continue. Hence, this will increase the rate of adoption of donkey farm power since a number of people are willing to adopt it. Therefore, this will also increase its diffusion in the village as well as the whole village than it is currently. Furthermore, the cattle restocking exercise need to be initiated and taken so seriously after all the logistics measures such as

construction of dip tanks and establishment of a cordon line to restrict livestock movements are done. These will prevent further outbreak of other contagious diseases such as foot and mouth disease and ECF.

CHAPTER SIX

DISCUSSION OF THE RESULTS

6.0 Introduction

The research findings are discussed in this chapter. The issues covered are those related to animal draught power and agriculture production in Matondo village. Therefore, the hypothesis are tested in this chapter to find out whether there is any relationship between the variables given in the hypothesis. Hence, the relationship between animal draught power which are oxen and donkeys and agricultural production is discussed. It is then followed by a discussion on the diffusion/adoption of donkey farm power in agriculture. The findings are reasonably inferred within the context of animal draught power and other aspects within the agriculture sector.

6.1.1 The relationship between Animal Draught Power and Agriculture Production

From the data obtained in the field, the relationship between animal draught power and agriculture production are compared. The respondents covered here are those who use oxen, donkeys or a combination of the two in agricultural production. This is because, these animals, form what is called animal draught power used in agriculture.

Therefore, to test whether there is any relationship between animal draught power and agriculture production in Matondo village, Spearman Rank Correlation is used. Hence, the following formula is used.

$$r_s = 1 - \frac{6\Sigma Di^2}{n(n^2 - 1)}$$

where;

r_s = The Spearman Rank-Order Correlation Coefficient

D_i = The difference between the ranks of each pair of scores

n = The number of pairs of rankings

D^2 = The squared difference which is later summed

$\sum$ = Summation

The variables that are tested which are stated in the first hypothesis are pairs of animal draught power and agriculture production in terms of the number of bags produced per household. These are ranked as shown in (Appendix 2: Table 1). It is then followed by a computation of these variables as shown in (Appendix 3). The formula given above is used to come up with the conclusion on the relationship.

Therefore, considering Spearman Rank Correlation, the rule stipulates that; reject the Null hypothesis (Ho) if the calculated value of r_s is greater than the critical value at the chosen significance level. Hence, when the Null hypothesis is rejected, then the alternative hypothesis is accepted. Therefore, for this research, the Null hypothesis states that "there is no relationship between animal draught power and agriculture production in Matondo village." Thus, when the computation is done and tested, the Null hypothesis is rejected. This is because the r_s calculated (0.75) is greater than the critical (0.30) at the significance level of 0.05 at the degree of freedom 31 for a one tailed test. Due to this, the Alternative hypothesis is accepted. Hence, there is a significant relationship between animal draught power and agriculture production in Matondo village. This means, agriculture production in Matondo village is dependent on the number of draught animals the household have. In addition, agriculture production is dependent on the availability of animal draught power pairs the households have In other words, there is a correlation between animal draught power and agriculture production in Matondo Village. As a result, the Alternative Hypothesis which states that "there is a relationship between animal draught power and agriculture in Matondo Village" is accepted. Therefore, as (Table 10) shows, out of the 40

households sampled, 12(30%) households have oxen, 9 (22.5%) have donkeys and 10 (25%) have oxen and donkeys. Hence 31 (77.5%) of the respondents either use oxen or donkey or both donkeys and oxen in agriculture production. Therefore, this is a reason as to why there is a relationship between animal draught power and agriculture production for 31 out of the 40 interviewed respondents use draught animals. Furthermore, when the number of people who do not have animal draught power is considered, only 8 (20%) of the respondents as shown in (table 10) falls in this category. As a result, a large proportion of the respondents have animal draught power they use in agriculture production.

In addition, (table 5) and (table 7) shows the households with cattle and donkeys respectively. When (table 5) is considered, out of the 40 households, only 10 (25%) have no cattle while 30(75%) have cattle. While on the donkeys, (table 7) shows that 21(59.5%) have donkeys and only 19(47.5%) have no donkeys. Because of this, it can be concluded that it is true that there is a relationship between animal draught power and agriculture production. This is because most of the households have either donkeys or cattle, specifically oxen. As a result, they have the farm power mechanization which is faster than handhoeing which is related to the production. However, there are some other factors that influence agriculture production which are responsible for the 2 (two)variables (animal power and agriculture production) to be related. These other factors are outlined below.

6.1.2 The influence of Veterinary Assistants and Camp Officers

The availability of the Veterinary Assistants and the Camp Officers have great influence on agriculture production. This is because they monitor the health of cattle and donkeys by making them healthy always. This is done in their quest to combat ECF disease completely. In doing so, the cattle are treated constantly. Hence, they become health and strong enough to work for longer hours in agriculture. Because of this, the use of draught animals can help in raising the living standards of the rural communities, (Starkey, 1996). This is actually the

case with Matondo village. Due to the use of animal draught power, they produce enough for their household food needs and some surplus as shown in (fig 6). Furthermore, according to Crossley and Kilgour (1983), a health ox has a typical working speed (m/s) of 0.9 and working hours per day of 6. In addition, the working speed of most draught animals when working at optimum pull is about 1m/s. Because of these characteristics of animal draught power and the influence of the Veterinary Assistants and the Camp Officers who treat the cattle, it can therefore be concluded that, the presence and availability of animal draught power have an influence on the number of bags of maize produced in Matondo village. Hence, animal draught power is capable of meeting the household or national level food requirements.

6.1.3 Care International Zambia

Care International Zambia teaches the farmers in Matondo village beter methods of sustainable agriculture. They do this to all the villagers, both to the cattle and donkey owners and those who do not own animal draught power. They do this by encouraging farmers to adopt pot-hoeing farming, a form of conservation tillage. Through this, labour is reduced, soil erosion is also reduced and improves air and water quality. Furthermore, it improves water harvesting for agriculture purposes, increases opportunity for early planting and improves yields, hence food security. Therefore, this form of farming together with the presence of animal draught power are responsible for improved food security status in Matondo village.

6.2 Agricultural Production Recovery and the Recent Diffusion/Adoption of Donkey Draught Powers

The performance of the donkey draught power in agriculture production in terms of the number of bags of maize produced is also tested. This is done to find out whether the recovery in agricultural production in Matondo village is as a result of recent diffusion of donkey draught power or not. Spearman Rank Correlation is also used here in which the variables (pairs of donkeys only and the number of bags produced are ranked as shown in (Appendix 4; table2). The computation is

also done to come up with the conclusion on the stated hypothesis as shown below the table of ranked variables.

When the test is done, the positive relationship between the two variables is found. The Null hypothesis which states that "Recovery in agricultural production is not a result of the recent diffusion/adoption of donkey draught power" is rejected at 0.05 significance level and at 9 degrees freedom. This is because the r_s calculated (0.612) is greater than the r critical (0.600). Hence, the alternative hypothesis is accepted. Therefore, "the recovery in agricultural production in Matondo village is a result of the recent diffusion/adoption of donkey draught power." This means, the improvement in agriculture production in the village is the result of a number of people who have adopted donkeys. When (table 10) is considered, 9 (22.5%) are using donkeys only in agriculture, while 10 (25%) use both donkeys and oxen. There is therefore some improvement in the number of people who have adopted the donkeys when compared to the Pre-ECF when only 5(12.5%) had donkeys. This then means even their use in agriculture production has increased. Furthermore, (table 8) shows the households that have donkeys, with 8 (20%) households having 5 and above donkeys. While (table 12) shows the pairs of donkeys household owns and agriculture production. Therefore from (table 12) it is actually correct to say that the recent donkey diffusion in Matondo village has contributed to agriculture recovery. This is because of the donkey pairs capability to produce even more than 50 bags per pair. On the other hand, (table 11) shows some of the respondents' views on the performance of the donkeys in agriculture. Out of the 40 respondents, only 3 (7.5%) argued that the donkeys are not stronger than oxen while 37(9.25%) argued in favour of the donkeys with 8(20%) saying donkeys are excellent and walk faster than oxen. Hence, from this scenario, it can be deduced that the adoption of the donkeys in Matondo village has led to the recovery in agricultural production. This is because of their potential power and speed. Crossley and Kilgour (1983) argues that the donkey has a typical working speed (m/s) of 1.0 and 4 working hours per day. Because of this, they are better than handhoeing which can then increase household food security.

In addition, when (table 12) is crtically considred, a pair of donkeys can produce more than 50 bags of maize. As a result, this amount is enough to feed a household of not more than 20 members. Therefore, the diffusion of the donkeys has helped to improve agriculture production of the households who initially depended on handhoeing. Furthermore, (fig 3) shows the reduction of cattle population of Kalomo district from the year 2000 to 2002. While on the other hand, the district is experiencing some increase in terms of agriculture production. It was found that during the 2001/02 farming season, about 591,374 x 50 bags of maize were produced. This later increased to 900,000 x 100 bags of maize during 2002/03 farming season (DACO, 2003). This means with increase in district agriculture productivity there is also an increase in agriculture production even in Matondo village. But with the reducing number of cattle in the whole district, people have resorted in adopting an alternative form of farm power which in this case are donkeys. Hence, donkey adoption did not only increase agriculture production in Matondo village, but Kalomo district as a whole. This is so because the Kalomo district survey department under the Ministry of Agriculture are training farmers donkey traction at Palabana as well as linking them to cheaper sources of donkeys (DACO, 2003). Because of this, the district of Kalomo although with the decreasing cattle population is experiencing an increase in agriculture production. This is actually the same with Matondo village. Therefore, the recovery in agriculture production even with continued existence of ECF is due to the recent diffusion of donkeys in Matondo village.

Furthermore, out of the 40 respondents, 22 (55%) argued that the current production in the village is enough to meet their household food requirement. The current agriculture production in the village 2001/02 farming season is shown in (table 13). As shown in the table out of the 40 respondents, 28 respondents are producing between 10 to 40 and above bags, with 8(20%) out of the 28 respondents producing more than 40 bags. And only 11 (27.5%) producing between 0 to 9 bags. This production is followed by some surplus as shown in (fig 5) in the Pie Chart. Hence 9 (22.5%) of the 40 respondents produces 10 and above bags as surplus. Therefore, this improvement in the household agriculture

production which is accompanied with some surplus is not as a result of using oxen alone, but some adoption and use of donkeys. This is because people are no longer depending on handhoeing alone, but donkeys which are strong and capable of producing enough compared to handhoeing.

However, some households argued that the current production is not enough to meet their household food needs. This is evidenced from other supplementing measures the people are involved in as shown in (fig 7) and lack of surplus as shown in (fig 6) in which 18 (45%) never produce any surplus. The main reason as to why the production is not enough to meet their household food needs is due to big household sizes which are still in existence in Matondo village. About 6(15%) households have more than 20 family members with 17(42.5%) having 5 to 9 members and 6 (15%) having 15 to 19 members. Hence, with such family size members, it is possible for such households to have food deficit. The other cause of food shortages are ages involved in agriculture. It was found that the respondents involved in agriculture were those above 40 years who were 20 (50%). While the young ones are involved in other ventures such as business. As a result, agriculture in Matondo village is viewed as old man's job. Unfortunately, the old people are not strong enough to produce enough to meet the households' needs. Hence, it is basically true that some households headed by old people do not have enough to feed their families.

The educational status of the respondents also matters in ensuring food security. As shown in (table 2), the majority of the respondents have primary education level with very few having secondary and tertiary education. Since education is a gateway to modern technology, and the people of Matondo village have low education, it is possible to experience some food shortages. This is because uneducated person take time to adapt to new technology. This is basically why the rate of diffusion/adoption of the donkey farm mechanization is very slow as shown in (fig 5) in which 35 (87.5%) of the respondents argued that this farm mechanization is not diffusing very fast. Hence, lack of education is one factor which is attributed to low agriculture production. Therefore slow rate of donkey

diffusion and low education are responsible for low agriculture production. The other factor which causes low agriculture production can be attributed to the marital status of the respondents. As shown in (table 1) out of the 8 interviewed women, 6 women are heading households because they are either widowed, divorced or separated. Therefore, research findings reviewed that women do not easily access loans from the banks and other rendering institutions for they are viewed to be unable to pay back the loans. Furthermore, they lack capital to buy farming inputs. This is further compounded by lack of farming power in which the giving of farming inputs is in most cases favoured towards men. Hence, this picture is responsible for low production in the village which leads to household food insecurity. In addition, the majority of the people are not able to buy the donkey pairs because they are expensive as shown in (table 9) which increased with an increase in the number of people buying the donkeys after 1999 (table 8) or in demand. This is basically the reason why this type of farm mechanization is not diffusing so fast which indirectly cause low food production for it is affordable only to the few rich households. The other factor is lack of rights to the land for it is held under traditional leasehold with the royal family as the main controller of the land.

Finally, although donkey farm mechanization is spreading very slowly, the donkeys are assuming increasing importance as power sources in agriculture. This is evidenced from the establishment of Siameja donkey training center and Palabana were farmers are taught about donkey traction, (DACO,2003). Nevertheless, the major limiting factor of donkey spread/diffusion world-wide is the prohibition on the use of its flesh as meat or the drinking of its milk, (Payne,1994).

CHAPTER SEVEN

CONCLUSIONS AND RECOMMENDATIONS

7.0 Introduction

This chapter summarizes the major findings of this study. It also make some recommendations on what should be done to ensure even adoption of donkey farm mechanization as an alternative farm power. The measures that the Government and the NGOs should do to beef up cattle population are also outlined. Finally the suggestions for future research wrap the chapter.

7.1 Conclusions

The overall purpose of this study was to make an assessment of animal draught power in agricultural production. The main targets were the oxen and donkeys performance in agriculture production in terms of the number of bags of maize produced.

The study revealed that currently, few people are owning cattle in Matondo village than during the pre-ECF period. Hence, the cattle population is decreasing with only 2,702 cattle in 2002 from the cattle population of 3,567 in 2001. The cause of this decrease in cattle population is ECF disease which is still in existence in the village. Currently, it was found that only 1 household in Matondo has a cattle population of 18 while the majority has less than 10 cattle. Due to this, the village agriculture production is also going down. It was found that some households are experiencing some food shortages with some poverty levels going up.

The study further revealed that with some decrease in cattle population, some households in the village have switched off to another alternative source of farm power. This alternative farm power is the donkey farm mechanization. Therefore, donkeys have been adopted as another form of farm power to replace the lost cattle. However, it was found that although people are adopting the

donkeys as another form of farm power, the rate of adoption is very slow. Fewer people have adopted this form of farm power. Nevertheless, although the rate of adoption is low, donkeys are better form of farm power than handhoeing. This is due to their ability to increase the household food needs. Hence, the study revealed that, the households that have adopted this farm power have enough to feed their families and even leave some surplus. Therefore, it was found that the recent recovery in agriculture production in Matondo village is as a result of some households that have adopted this farm power technology. This is due to their capacity to work on the farm just as oxen.

Furthermore, the study revealed that there is a relationship between animal draught power and agriculture production. This was done by looking at the number of bags produced per pair of draught animal. Therefore, the study revealed that although the number of bags produced varies from pair to pair of draught animals they are related to the animal pairs. Hence, the families with enough pairs of draught animals are able to produce more than enough to feed their families. Due to this, the study showed that animal draught power has greatly empowered the people of Matondo village as well as the whole of Kalomo district.

However, the study also revealed some problems the households of Matondo village faces. Some of them are lack of proper marketing of the crops, lack of capital, expensive cost of donkey pairs, lack of farming inputs and lack of knowledge about the cheaper sources of donkeys. Due to these problems, it was found that people have found it difficult to buy the donkeys. This has further affected the rate of donkey adoption. It was also found that although people have the knowledge that donkeys could be used in agriculture production, the problem concerning their cheaper sources have affected its rate of spread. People are willing to adopt the donkeys, but they lack their cheaper sources. As a result, people are unable to source them.

Therefore, because of these problems, the study suggested some measures that the government should do. Some of these measures are; setting up of an organization or appointing an NGO that will deal with sensitizing and teaching the people the value of donkeys in agriculture. The government should also give loans to the farmers either in form of capital or donkeys. This will encourage all the people to adopt the donkeys to ensure its even adoption in the whole village. It was also found that farmers especially small scale farmers should be taught regularly on the preventive measures of ECF disease. This will therefore help to prevent more cattle deaths in the whole village through the vaccination exercise.

The study also revealed that the government under the ministry of agriculture needs to take restocking programme so seriously. This can be done by first constructing dip tanks in ECF affected areas. Second, the sustainability of the cattle-restocking programme need to be the top priority of all agriculture development programmes. Finally, there is need to set a cordon line to restrict livestock movement to prevent the spread of ECF disease. Hence, once the cattle-restocking programme and donkey adoption succeeds, it will in no doubt, lead to economic and agriculture rejuvenation of Matondo village as well as Kalomo district.

7.2 Recommendations

Animal draught power especially the donkeys are seen to be one of the alternative farm power especially in ECF infected areas. Therefore, since animal draught power, the oxen and donkeys are one of the main farm mechanization power, the following recommendations have been made:

- There is need for the promotion of co-operatives to procure animal drugs and management of dip tanks. This is because small scale farmers individually can not afford to run dip tanks due to high costs

- There is need for restricting animal movements within and outside the district. This restriction can be done through enforcement of current livestock movement regulations through neighborhood committees

- The introduction of other forms of animal draught power especially the donkeys must be enhanced. This will ensure even adoption and use of donkeys in the village as well as the whole district

- Loans must be provided to farmers in terms of money or donkeys so that, all the farmers who are willing to buy donkeys can do so.

- To improve the village and district production in terms of crops and livestock, the farmers and the government need great co-ordination of activities. This is in terms of subsidizing the production so that the cost of inputs and drugs are affordable.

- Co-operatives should be strengthened as an avennue to access various inputs and help in the marketing of both crops and livestock. This is so because livestock are pillars of agriculture production.

- There is need for constant dipping of cattle to kill ticks that cause ECF.

- Livestock drugs need to be subsidized to make them affordable to the small-scale farmers.

- Linking of farmers to cheaper sources of donkeys need to be enhanced and encouraged to ensure its even adoption by all small-scale farmers

- The lending institutions and the NGOs should first consider assisting the women in rural areas for they are the main producers and providers of household food needs.

7.3 Suggestions for future research

Having done the research, it can be suggested that future research should target on how fast people can adopt donkey farm mechanization. It should also look at why some NGOs and the other organizations are not involved as the government is beefing up cattle population and why are most areas affected with cattle diseases despite government efforts to combat them. Finally, measures on how the produced crops should be marketed must be assessed to encourage farmers to produce enough with some surplus to fight hunger at household levels.

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APPENDICES

APPENDIX 1

The tables below show the crop production figures from 1999 to 2003 seasons.

Table 1. District Crop Production for 1999/2000 season.

Crop	No. Farmers	Area Planted (Ha)	Expected Production
Maize	12,000	32,429	610,772 x 90Kg
Sunflower	2000	2,680	29,523 x 50Kg
Groundnuts	5101	5,170	52,163 x 80Kg
Sorghum	901	310	1,192 x 90Kg
Cowpeas	8768	410	2,031 x 80Kg
Sweet potato	1001	693	292,700Kg
B/Millet	700	2,024	19,302 x 90Kg
Cotton	2500	3,412	1,250,800Kg
V/Tobacco	700	83	4,980Kg

Table 2. District Crop Production for 2000/01 season.

Crop	No Farmers	Area Planted (Ha)	Expected Production
Maize	15,892	87,245	1,215,328 x 90kg
Sunflower	3144	5,010	22,545 x 50Kg
Groundnuts	11,089	6,936	35,191 x 80Kg
Sorghum	3,517	2,965	14,825 x 90Kg
Cowpeas	2,650	635	5,080 x 80Kg
Sweet potato	3,178	463	694,500Kg
B/Millet	2,511	1,506	10,542 x 90Kg
Cotton	1,321	2,895	1,447,500Kg
V/Tobacco	379	1,086	1,520,400Kg

Table 3. District Crop Production for 2001/02 season.

Crop	No Farmers	Area Planted (Ha)	Expected Production
Maize	16300	67,401	591,374 x 50Kg

Sunflower	4400	5,670	22,680 x 50Kg
Groundnuts	9100	6,957.5	13,915 x 50Kg
Sorghum	2300	269	810 x 50Kg
Cowpeas	3201	1,314	9,198 x 50Kg
Sweet potato	4100	458	81,200Kg
B/Millet	1520	905	4,525 x 50Kg
Cotton	1601	3,647.1	1,094,130Kg
V/Tobacco	550	845	628,730Kg

Table 4. District Crop Production for 2002/03 season.

Crop	No Farmers	Area Planted (Ha)	Expected Production (t)
Maize	17,683	7,960.5	1,490,680.3
Sunflower	4,116	4,060	8,942
Groundnuts	5,198	6,200	15,171.2
Sorghum	4,590	548	436,000
Cowpeas	4,801	7,872	14,245.8
Sweet potato	5,330	3,737	920,043.4
B/Millet	1,467	844	140.6
Cotton	1,761	34,141	142,896.1
V/Tobacco	770	1,280	988,000

APPENDIX 2

STATISTICAL TEST 1 RAW DATA FOR DRAUGHT ANIMALS

Table 1. Relationship between animal draught power and agriculture production in Matondo village.

Respondent's pairs of animal draught power [oxen and donkeys]	Rank 1	Total No. of bags of maize produced per household: surplus inclusive	Rank 2	D_1	D_1^2
1	22.5	10	24.5	-2	4
1	22.5	30	14.5	8	64
2	8	90	2	6	36
1	22.5	10	24.5	-2	4
1	22.5	5	26.5	-4	16
1	22.5	4	28	-5.5	30.25
1	22.5	3	29	-6.5	42.25
2	8	15	23	-15	225
1	22.5	5	26.5	-4	16
3	2	350	1	1	1
2	8	55	8	0	0
2	8	41	12	-4	16
1	22.5	20	19.5	3	9
2	8	72	4	4	16
2	8	39	13	-5	25
1	22.5	25	17	5.5	30.25
4	1	60	7	-6	36
2	8	50	11	-3	9
1	22.5	20	19.5	3	9
2	8	63	6	2	4
1	22.5	80	3	19.5	380.25
1	22.5	27	15	7.5	56.25
1	22.5	16	22	0.5	0.25
1	22.5	25	17	5.5	30.25
2	8	65	5	3	9
2	8	53	9	-1	1
1	22.5	17	21	1.5	2.25
1	22.5	30	14.5	8	64
1	22.5	25	17	5.5	30.25
2	8	51	10	-2	4
1	22.5	2	30	-7.5	56.25

$\Sigma d^2 = 1226.5$

APPENDIX 3

STATISTICAL TEST 1 COMPUTATION

Relationship Between Animal Draught Power and Agriculture Production in Matondo Village

Hypothesis

Null hypothesis: There is no relationship between animal draught power and agriculture production in Matondo Village.

Alternative: There is a significant relationship between animal draught power and agriculture production in Matondo Village

Computation: Formular

$$r^{s} = 1 - \frac{6\Sigma di^2}{n(n^{2-1})}$$

SIGNIFICANCE TESTING

Level of Significance; 0.05

Type of test; One tail test

Degree of Freedom (DF); 31

Critical value;

For the critical value, it can be got by using the calculations shown below. This is because the DF is greater than 30.

$$r_s = Z\sqrt{1/(31-1)}$$

$$= 1.645\ \sqrt{1/30}$$

$$= 1.645 \text{ X } 0.301035$$

$$= 0.301$$

$\therefore$ the r critical value

$= 0.301.$

RULE: Reject Ho if r_s calculated is greater than the r critical.
Hence, accept H_1
$\therefore$ Reject Ho if r_s >r critical

Computation:

$$r^s = \frac{1 - 6\Sigma di^2}{n\left(n^{2-1}\right)}$$

$$= 1 - 6 \text{ x } \frac{1226.5}{31\left(31^2 - 1\right)}$$

$$= 1 - \frac{7359}{31(961\text{-}1)}$$

$$= 1 - \frac{7359}{29760}$$

$$= 1 - 0.247278225$$

$$= 0.752721775$$

$$r^s = 0.75$$

DECISION: The Null hypothesis is rejected while the alternative hypothesis is accepted. This is because the r^s calculated is greater than the r critical.

$$r^s Cal > r\,Critical$$

$$0.75 > 0.30$$

CONCLUSION: There is a significant relationship between animal draught power and agriculture production in Matondo village.

APPENDIX 4

STATISTICAL TEST 2 RAW DATA FOR DONKEY PAIRS

Table 2: Agricultural Production Recovery in relation to recent diffusion/adoption of donkey draught power

DONKEY PAIRS OF RESPONDENTS	RANK 1	TOTAL BAGS OF MAIZE PLUS SURPLUS	RANK 2	D_1	Di^2
2	2	63	3	-1	1
1	6.5	80	1	5.5	30.25
1	6.5	27	6	0.5	0.25
1	6.5	16	9	-2.5	6.25
1	6.5	25	7	-0.5	0.25
2	2	65	2	0	0
2	2	53	4	-2	4
1	6.5	17	8	-1.5	2.25
1	6.5	30	5	1.5	2.25
					$\Sigma d = 46.5$

Hypothesis

Null hypothesis: Recovery in agricultural production is not a result of the recent diffusion/adoption of donkey draught power.

Alternative hypothesis: The recovery in agricultural production in Matondo Village is a result of the recent diffusion/adoption of donkey draught power

Computation Formular

$$r^s = 1 - \frac{6\Sigma di^2}{n(n^2 - 1)}$$

SIGNIFICANCE TESTING

Level of Significance; 0.05

Type of test; One tail test

Degree of Freedom (DF); 9

Critical Value; 0.600

RULE: Reject Ho if calculated Value (r_s) is greater than the r critical and accept the alternative hypothesis.

$\therefore$ Reject Ho if $r_s > r$ critical
Accept H_1 if r critical $< r_s$

Computation:

$$r^s = 1 - \frac{6\Sigma di^2}{n(n^2-1)}$$

$$= 1 - \frac{6x46.5}{9(9^2-1)}$$

$$1 - \frac{279}{9(81-1)} = \frac{279}{9x80} = \frac{279}{720} = 0.3875$$

$$= 1 - 0.3875$$

$$= 0.6125$$

$$r^s = 0.612$$

DECISION: The Null hypothesis is rejected and the alternative hypothesis is accepted.

$r^s = 0.612$

r critical = 0.600
$\therefore r^s >$ r critical
0.612 > 0.600

Therefore, Ho is rejected because r_s calculated is greater than the r critical.

CONCLUSION: The recent diffusion/adoption of donkey draught power has led to agricultural production recovery of Matondo Village. This is because r_s calculated had been rejected for it is greater than r critical

APPENDIX 5

QUESTIONNAIRE FOR THE RESPONDENTS

INSTRUCTIONS: Please answer the questions the way they appear either by ticking or writing brief notes.

SECTION A
PERSONAL INFORMATION

This section is about the information on your particulars.

1. Sex.....
2. Age:.....
3. What is your marital status?

   Single [ ] Married [ ] Widowed [ ] Divorced [ ] Separated [ ]
4. What is the size of your household?

   0 – 4 [ ] 5 – 9 [ ] 10 – 14 [ ] 15 – 19 [ ] 20 – 24 [ ] 25 and above [ ]
5. What is the highest educational level of the household head?

   Primary [ ] Secondary [ ] Tertiary [ ] Never been to school [ ]
6. Is the household head a former employee?

   Yes [ ] No [ ]
7. What was his/her type of occupation?

   Informal [ ] Formal [ ] Non applicable [ ]
8. How long had you been here?

   ..... (write number of years)

SECTION B

FAMILY AGRICULTURE PRODUCTIVITY

This section seeks to find out the family production in agriculture.

9. What is your current agriculture production?

   0 – 9 [ ] 10 – 19 [ ] 20 – 29 [ ] 30 – 39 [ ] 40 and above [ ] Nil [ ]
10. Considering your household size, is this production enough to meet your household food requirement?

    Yes [ ] No [ ]

11. How much surplus do you produce?

0 – 4 [ ] 5 – 9 [ ] 10 and above [ ] Nil [ ]

12. How different is this production from the pre-ECF period?

.....(write indicating number of bags you used to produce).

13. What are some of the sources of your household food needs?

.....

SECTION C

AGRICULTURE FARM USE

This section seeks to find out what you use as a family in agriculture.

14. What do you use in your agriculture production?

Oxen [ ] both oxen and donkeys [ ] Donkeys [ ] handhoeing [ ] (Tick)

15. How many cattle do you currently have ..... (write number)

16. How many cattle did you have before ECF? ..... (write number)

17. How many donkeys do you have?.....(write number)

18. Did you have donkeys before corridor epidemic?

Yes [ ] No [ ]

19. When did you first buy your donkeys?..... (write year)

20. Where did you buy them?.....(write place)

21. How much did you pay for your (pair of) donkeys.....(write amount)

22. Are there other donkey owners in the village?

Yes [ ] No [ ]

23. If yes to 22, which year did they buy these donkeys?.....

24. Did any one tell you about donkey use in agriculture?

Yes [ ] No [ ]

25. If yes to 24, who are they?.....(write name)

26. Does any one treat your donkeys to ensure that they are always health?

Yes [ ] No [ ]

27. How is this donkey farm mechanization spreading in the village?

Very slow [ ] Very fast [ ]

28. How do you think this farm mechanization could be boosted up?

.....(write briefly)

29. Is there any organization teaching about donkey farm mechanization adoption?
..... (write its name)

30. Do you think lack of oxen draught power leads to low agriculture production?
Yes [ ] No [ ]

31. Do you think adoption of the donkey draught can increase agriculture production?

Yes [ ] No [ ]

32. Do you think recovery in agricultural production is because of the recent diffusion of donkey draught power?
Yes [ ] No [ ]

33. What do you think could be done so that everyone adopt the use of donkeys in agriculture production in this village?

.....

34. What is your general comment on the performance of donkeys in agriculture production?
.....
..... (write briefly)

END

THANK YOU VERY MUCH FOR YOUR TIME

APPENDIX 6

For Agricultural Officials

INSTRUCTIONS: Please answer the questions the way they appear either by ticking or writing brief notes

SECTION A

BACKGROUND INFORMATION

This section is about the information on your particulars.

1. Sex [ ] Male [ ] Female [ ]
2. What is your age?.....
3. What is your occupation position at this institution?
   ..... (write your position e.g. planning officer)
4. How long have you been working here?
   ..... (write number of years)

SECTION B

DISTRICT AGRICULTURE PRODUCTIVITY

This section seeks to find out the district agriculture production as well as in Matondo Village

5. What is the current agriculture production of Kalomo district?
   ..... (write number of bags)
6. What is the current agriculture of Matondo Village?
   ..... (write number of bags)
7. Is this production rate okay?
   Yes [ ] No [ ]
8. If No to 7, what is the cause of such a production rate?
   .....
   ..... (write briefly)

9. How is the current production rate different from the pre ECF agriculture production?

.....(approximate)

SECTION C

MEASURES TAKEN TO BOOST DISTRICT AGRICULTURE PRODUCTION

10. What does the farmers use in agriculture production?

..... (write them)

11. For the farmers that are using donkeys in agriculture, what have you done to ensure that all the farmers adopt this farm mechanization strategy?

.....

12. How have you found the rate of adoption of donkeys?

..... (comment)

13. What are your prospects concerning donkeys adoption and use in agriculture production in both Matondo Village and Kalomo District?

END

THANK YOU FOR YOUR TIME

APPENDIX 7

INTERVIEW SCHEDULE

For Veterinary Officials

INSTRUCTIONS: Please answer the questions the way they appear either by ticking or writing brief notes

SECTION A

This section is about the information on your particulars

1. Sex [ ] Male [ ] Female [ ]
2. What is your age?.....
3. What is your occupation position at this institution?
   ..... (write your position ie planning officer)
4. How long have you been working here?
   .....(write number of years)

SECTION B

DISTRICT CATTLE POPULATION

This section seeks to find out the number of cattle and donkeys in the district.

5. How many cattle does the district currently have?
   ..... (write the figures)
6. Before ECF epidemic, the district had how many cattle?
   .....(write the range)
7. How many donkeys are there in the district?
   ..... (write the range)
8. How many donkeys are there in Matondo Village?
   .....(write the range)
9. Do you have any idea of the place they bought them?
   Yes [ ] No [ ]

10. If Yes to 9, name the place?

.....

.....

..... (Name as many as possible)

SECTION C

MEASURES TAKEN TO IMPROVE ANIMAL HEALTH.

This section seeks to find out what measures are being done to ensure that animals are always in good health.

11. What do you do to make sure that farmers' animals are always in good health?

.....

.....(write briefly)

12. How are farmers responding to your services?

.....

.....(write brief notes)

13. What do you do to ensure that farmers comply to your regulations pertaining the given services?

.....

.....

14. How is the general health of animals in Matondo village as well as the whole district?

.....

.....

15. As an institution, what are your prospects on Matondo village's animal health?

.....

.....

END

THANK YOU FOR YOUR TIME