

Assessing the Factors influencing Farmers' Decisions in the Control of East Coast Fever in Kafue, Zambia



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DEDICATION

To the memory of a strong woman who was my mentor and my friend, my loving mother, Janet

ABSTRACT

Kafue district which has a potential to contribute to Zambia's food security faces challenges in the control of East Coast Fever (ECF).

The objective of the study was to gain knowledge of the factors influencing decisions of small scale farmers' with regards to control of ECF. This is in order to improve the tick control strategies among the farmers through dipping and spraying so as to reduce the incidences of ECF and reduce cattle mortality and morbidity. A conceptual model of decision making in animal health proposed by Chilonda & Van Huylbroek (2001) was used as a conceptual framework.

Using a combination of qualitative and quantitative research methods in form of questionnaires, PRA tools and interviews, information was collected from cattle owning household heads and officers in the Department of Veterinary Services. The study revealed that high cost of acaricide, inadequate water resources and the seasonality of ECF occurrence influenced farmer's decision making in carrying out dipping and spraying. These were compounded by low levels of literacy among farmers attributed to the farmers' inability to use the correct strength of acaricide. It was therefore recommended that department of veterinary services improves information delivery on issues regarding ECF transmission and control through use of radio and focus group meetings and also revisits its policy with regards to ECF control, by finding alternative methods such as ECF immunisation.

Key word: Cattle, Decision making, East Coast Fever, Kafue, small scale farmers, Zambia

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LIST OF ABBREVIATIONS AND ACRONYMS

CSO	Central Statistics Office
CBPP	Contagious Bovine Pleural Pneumonia
CVO	Chief Veterinary Officer
DVO	District Veterinary Officer
DVS	Department of Veterinary services
ECF	East Coast Fever
FAO	Food Agriculture Organisation
FRA	Food Reserve Agency
FMD	Foot and Mouth Disease
GDP	Gross Domestic Product
PRA	Participatory Rural Appraisal
MACO	Ministry of Agriculture and Cooperatives
MLFD	Ministry of Livestock and Fisheries Development
MP	Member of Parliament
NALEIC	National Livestock Epidemiology and Information Centre
NA	New Agriculturist
VA	Veterinary Assistant
ZMK	Zambian Kwacha (currency)

CHAPTER 1- INTRODUCTION

1.1 Back ground

Zambia is a landlocked country surrounded by eight neighbours. Central Statistics Office (CSO) reported in 2010 that the population of Zambia stands at 13 million. It has a copper dependent economy which has made it vulnerable to the fluctuations of copper prices on the world market. In 2012 New Agriculturist (NA) reported that, with the privatization of state-owned copper mines, high copper prices and increased foreign investment, the economy has boasted of a strong GDP growth at about 6% in recent years. However, over 60% of the country's population still live in poverty and rely on small-scale subsistence farming for a livelihood (NA, 2012). Food Agriculture Organization (FAO) in 2011 reported that 43% of Zambia's population is food insecure.

As a way of reducing poverty the Zambian government has made efforts to move away from copper dependency and invest in other sectors such as agriculture. Ministry of Agriculture and Cooperatives (MACO) reported in 2010 that the sector which employs 80% of the country's labour force continues to lag behind. Factors such as drought, livestock diseases, inadequate government investment and poor absorption of technological innovation among farmers have adversely affected the sector (MACO, 2010).

Zambia's rural farmers produce close to 70% of the livestock and 80% of all agriculture products (MACO, 2010). They are engaged in mixed crop- livestock farming. Cattle and goats provide a significant income source for many rural communities, contributing 39 percent to household income. Nearly half of the rural households own livestock with approximately 310,000 rural households, owning cattle (World Bank, 2011).

However, cattle production has been drawn back by high prevalence of tick borne diseases. The main tick borne diseases are *Anaplasmosis*, *Babesiosis* and *Theilerioses* (East Coast Fever and Corridor disease). The latter, which from here on will be referred to as ECF, are very important tick-borne diseases caused by protozoon *Theileria parva* and responsible for killing a large number of cattle each year in Zambia (Billiouw et al., 1999).

Makala et al. (2003) reported that between 1997 and 2000, approximately 89,000 cases of tick-borne disease occurred among Zambia's cattle population, of which 19,420 were fatal. Therefore, ECF presents one of the most important threats to livestock production in Zambia. It currently persists in several areas of Zambia (Makala et al., 2003). In 2011 Ministry of Livestock and Fisheries Development (MLFD) reported that a total of 18,073 cases of ECF occurred in the country of which 4,911 were fatal. The most affected provinces were Southern, Eastern, Northern and Lusaka Province. Kafue district which is found in Lusaka province was one of the districts affected by this disease.

In order to control ECF, government has outlined dipping and spraying regimes of once a week during dry season and twice weekly, during rainy season. Other measures practiced are application of tick grease and the infection and treatment method. All these measures are financed by the cattle owners themselves as the disease is not recognised as one of national importance (Chilonda et al., 1999).

Despite government's outline on how to combat ECF through the above mentioned methods, Kafue farmers have continued to lose their cattle. In 2010, Kafue District Veterinary Officer (DVO) reported that 65% of all cattle deaths in the district were due to cases of ECF.

Research done on ECF has been mostly focussed on the parasite that causes the disease rather than the livelihoods of the farmers it affects. The studies have focussed on epidemiology of the disease and data was collected using mostly quantitative methods. These studies have yielded beneficial information for both farmer and policy makers. However, there is need for deeper understanding of socio-economic as well as agro ecological factors that influence farmers' decisions on the rate of intensification of dipping and spraying. The researchers seldom use participatory tools to collect information with regards to ECF.

1.1 Problem Statement

The Ministry of Agriculture and Livestock who are policy makers have inadequate knowledge on the continued loss of cattle due to ECF which can be controlled by dipping and spraying. There is a knowledge gap between the ministry and the farmers' socio-economic and agro- ecological factors that affect their decisions with regards to the adherence to the outlined dipping and spraying regimes.

1.2 Research Objective

The objective of this study is to gain knowledge of the factors influencing decisions of small scale farmers in Kafue to adhere to the recommended regimes for controlling ECF. This is in order to improve their adherence to dipping and spraying so as to reduce the prevalence of ECF and ensure food security.

1.3 Research Questions

- 1) What are farmers' internal factors that influence Kafue small scale farmers' decisions with regards to dipping and spraying?
 - I. What are the characteristics of farmers that influence their decisions in dipping and spraying?
 - II. What are the farm characteristics of small scale farmers in Kafue and what role do they play in influencing farmers decisions on ECF control?
 - III. What are the implications on house hold food availability, accessibility and sovereignty of not adhering to ECF control?
- 2) What are the farmers' external factors that influence their decisions with regards to dipping and spraying?
 - I. What interventions and facilities are available for ECF control in Kafue?
 - II. What is the current government policy on the delivery of veterinary services to small scale farmers?
 - III. What are the biophysical factors that influence occurrence of ECF in Kafue?
- 3) What is the perception of the farmers and the MAL officers on how the disease situation can be improved?

In order to answer the above questions, the conceptual model of decision making in animal health management suggested by Chilonda and Van Huylenbroek (2001) will be used.

CHAPTER 2- LITERATURE REVIEW

2.1 Introduction

This chapter discusses the key conceptual and theoretical issues that are relevant to the study. It highlights the context within which the key concepts are used in this paper. The concepts are decision making, ECF and food security. These concepts are inter-related in the sense that decisions made with regards to control of ECF have a bearing on household food security.

2.2 Decision Making

A decision maker is one who has to go through a process of decision making. Rogers (2003) described the process as follows:

“A decision maker first learns about an innovation and gains an understanding of how it functions in the *Knowledge* stage. He then forms a favourable or unfavourable attitude towards it in the *Persuasion* stage, chooses whether to adopt it in the *Decision* stage, and puts it into use in the *Implementation* stage. During the *Confirmation* stage, he seeks reinforcement of a decision already made, and may reverse the previous decision in response to new information. Decision makers are typically divided into five groups based on when they adopt an innovation. *Innovators* are the first adopters. They are venturesome and less risk-averse than other groups, and are comparatively wealthy and educated. The *Early Adopters* are next. They are well-respected and play the role of opinion leaders, meaning that others look to them as role models and imitate their adoption decisions. The *Early Majority* is the next group to adopt, followed by the *Late Majority*. The *Laggards*, who tend to have traditional values and low incomes, are the last.”

The description of decision making process by Rogers (2003) is part and parcel of a farmer's daily life not only regarding adoption of technology but how to allocate resources. According to Chilonda et al. (2001), small-scale farmers make decisions in animal health management as a result of the interaction of several variables. These are grouped into factors that relate to farmer characteristics such as age, education, attitudes and objectives of farming. Agriculture policies as well as the biophysical environment are also factors that influence farmers' decisions in animal health management.

Using an economic model as has been done in several studies may predict farmers' future decisions regarding adoption of certain technology, but that is to assume that all factors or variables remain constant. However, it can be argued that farmers' are not static in nature (Sonkila, 2002).

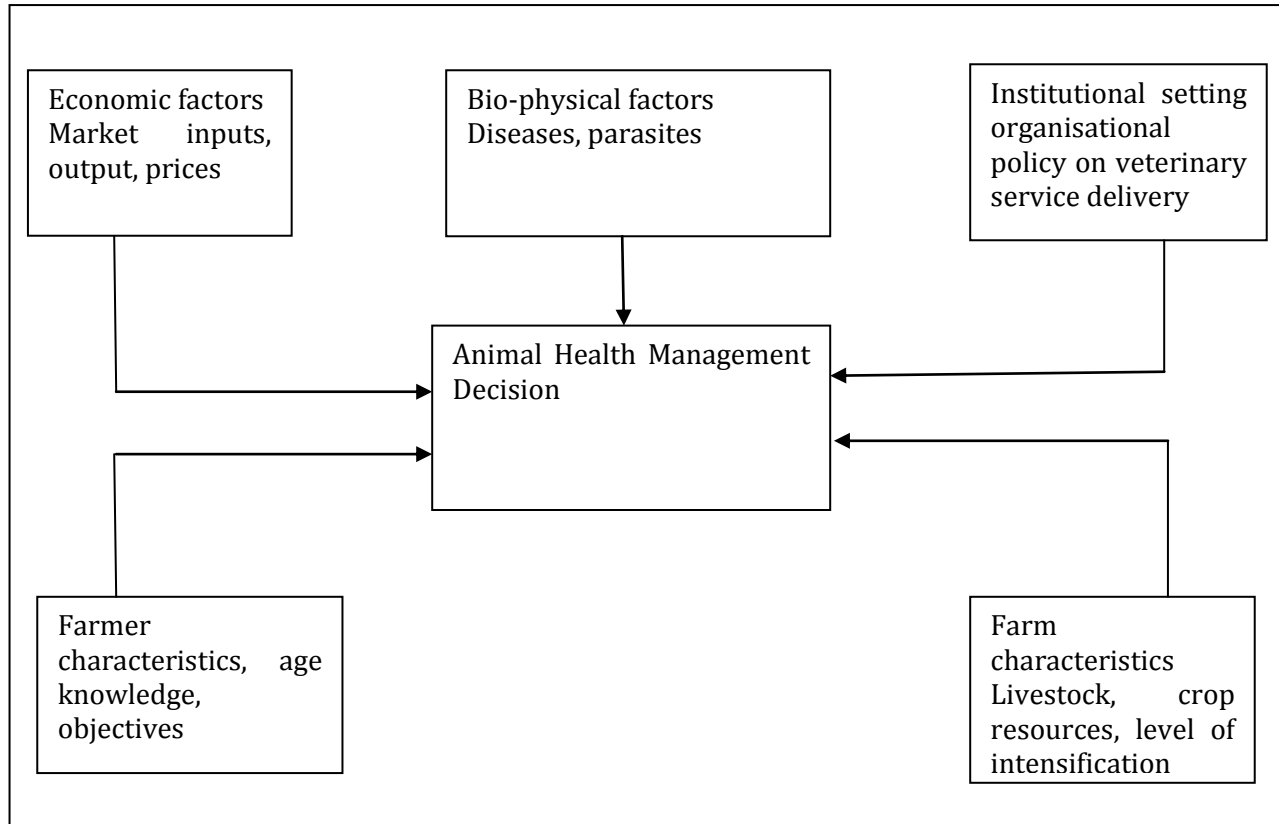
The economic model is also inadequate in understanding or predicting the farmer's behaviour especially among small scale farmers in rural Zambia. One of the variables used in the model is profit making and risk aversion. The model assumes that a farmer will be reluctant to spend on a technology that will yield little profit. However it can be argued that rural farmers are not entrepreneurs who go into farming for the sake of profit making. It is their way of life and not necessarily a profit making venture. Chilonda et al. (2000) observed that traditional farmers in the Eastern part of Zambia kept cattle for the main purpose of producing enough for the household rather than for sale.

Hence some decisions taken by the farmers are far from making economic sense to an observer. This is because they are influenced by many factors such as traditions and culture. A good example is slaughtering an animal during a funeral of a family member when the animal could have been sold to purchase inputs such as acaricides.

Nevertheless it gives guidelines in factors to focus on with regards to understanding decisions made by farmers in animal health management. The conceptual model for the factors

influencing decisions made by small-scale farmers in animal health management is shown in Figure 1.

Figure 1: Conceptual model of decision making in animal health management



Source: Chilonda & Van Huylenbroek (2001)

2.21 Biophysical Factors

Biophysical factors which influence decisions in animal health management relate to a number of different factors that determine the occurrence of disease in animal populations (Chilonda and VanHuylenbroek, 2001). These include determinants which can be categorized into intrinsic and extrinsic factors. The intrinsic factors are the physical or physiological characteristics of the host animal or the disease agent. These intrinsic factors also include virulence, method of transmission of the disease agent and the established host/agent relationship. Different aged animals and breeds differ in their susceptibility to disease. This can impact on farmers' decision to adopt animal disease control measures. Chenyambuga et al (2010) found that farmers did not adopt acaricide use to control ticks as they had observed that their animals did not die even when they were not dipped. Extrinsic factors relate to environmental conditions such as climate, and presence of determinants of disease, involved in disease transmission.

2.22 Institutional Settings

The institutional environments in which farmers operate have a bearing on decisions farmers make with regards to animal health management. Institutional setting refers to policy and organization of the veterinary delivery system, general infrastructure, distance to the veterinary services, and information source. The distance of a farm to the market will also influence decisions of farmers with regards to purchase of inputs. According to Ekoja (2008), farmers may not have the ability to adopt agriculture technologies on their own. This could be because of lack of awareness, or the inability to afford or appropriately apply the new techniques/technologies. He also noted that degree of interest a user has in a particular source of information determines the extent to which he uses the information or message conveyed by that source, and consequently adopts the innovation(s) prescribed.

Mandal, Khandekar and Khandekar (2006) also found that getting access to different sources of information influence knowledge, attitudes, and perceptions of the individuals' towards the technology. Chisenga, Entua-Mensah and Sam (2007) suggest that communication and the information flow dimension of the agriculture extension play a role in the accelerated diffusion and adoption of technologies. All these studies raise the issue of the role extension services play in influencing the decisions of farmers to adopt or not to adopt a technology.

2.23 Farmer Characteristics

Farmer characteristics such as age, education, attitude and objectives have been found to have an impact on decision making. Many studies have revealed that education level of heads of households has an impact on adoption rate and intensity. A study by Ekoja (2008) showed that the level of education had a significant bearing on adoption decision made by farmers in Nigeria. He observed that the highly educated farmers were more likely to adopt technology than those less educated.

Knight, Weir, and Woldehanna (2003) observed a positive correlation between education and intensity of adoption. The results of these studies are an indication that formal education is needed to counter the complexities of certain technologies. The complexity of technology is defined by Rogers (2003) as "the degree to which an innovation is perceived as relatively difficult to understand and use" (p. 15). As Rogers stated, opposite to the other attributes, complexity is negatively correlated with the rate of adoption. Thus, excessive complexity of an innovation is an important obstacle in its adoption. Odendo, Obara and Salasya (2011) also found that the schooling of the head of the household reduces risk aversion and encouraged the adoption of agricultural innovations in rural Ethiopia.

However, there is evidence that informal education also plays a role in increasing knowledge about the technology and hence increases the probability of adoption. Training programs and extension visits have been found to be useful forms of informal education. Participation in

training programs also increased adoption (Noltze, Schwarze and Quaim, 2012; Odendo, Obara and Salasya, 2011). Another factor affecting the likelihood of a farmer adopting an animal health technology is his attitude towards the technology. Chilonda and VanHuylenbroek (2001) suggest that adopters have a positive attitude towards the technology to be adopted. Mirza (2011) observed that a farmer's perception of the benefits of the technology have an influence on the adoption decisions.

2.24 Farm Characteristics

The characteristics of a farm or the type of production system are known to influence animal health management decisions. The level of market utilisation of production systems are important factors influencing decisions. McDermont(1999) observed that there was a difference in the degree of intensification in animal management between dairy farmers who are market oriented and pastoralist.

In addition the existence of markets for animals and animal products influences the production decisions of small-scale farmers, including animal health management decisions (Chilonda and Van Huylenbroek, 2001).

The other farm characteristics that affect a farmer's decision to adopt a technology are the resources that the farm has; such as the availability of water, land, the amount of income generated from sales of crops and livestock and the size of its livestock resource and labour (Chilonda Van Huylenbroek, 2001). Labour availability is an important factor which can deter or encourage adoption of a technology. Given that small scale farmers usually rely on their own labour, a labour intensive technology means more work. Thus a smaller family sized farm is less likely to adopt such a technology. Noltze, Schwarze and Quaim (2012) found that availability of labour impacted positively on rate of adoption.

Location of the farm is also an important factor that contributes to the rate and intensity of adoption. Odendo, Obara and Salasya (2011) found that location of the farm in relation to access to extension services impacted on adoption decisions. Farms located close to the extension services had more access to extension services which in turn increased the adoption rate.

2.25 Economic Factors

The economic factors that influence decision making in adoption can be divided into macro and micro. Given that small scale farmers do not exist in isolation or exogenously, a country's economic situation impacts on farmer's decisions to adopt a technology. For instance, prices of inputs are largely dependent on transaction prices. Countries which are landlocked face enormous transaction costs associated with imports of agriculture inputs. Transportation can account for half of the input price and thus reduce the profitability of their use (Jack, 2011).

The micro economic factors include the ability of the individual farmer to negotiate for the price of his farm outputs such as milk and carcass price. Poorly functioning and output markets erode profitability to the farmer and thus negatively affects the decision to invest in technology (Jack, 2011). Livestock producers have been shown to be very responsive to changing conditions of profitability and trade, as prices play a central role in production decisions of small-scale farmers Ali (1995) cited by (Chilonda Van Huylenbroek, 2001).

Infrastructure such as roads, markets, and communication infrastructure also play a crucial role in farmers decisions (Jack, 2011). The ability of a farmer to access credit has been found to have an influence on the decision to adopt a technology.

Yesuf and Kohlin (2008) found that limited access to credit had a negative effect on farmers' decisions to invest in a technology. Lack of credit for livestock production may influence animal

health management decisions in that those small-scale farmers who do not have access to credit may choose to use fewer animal health inputs or none at all.

2.3 East Coast Fever

Having discussed the literature concerning factors that influence farmers to adopt animal health technology, it is important to discuss dipping and spraying as control strategies for ECF. The following section will examine literature with regards to ECF transmission and most importantly, its control.

2.3.1 ECF Transmission

ECF as earlier mentioned in chapter 1 is caused by the protozoa *Theileria parva*. It is transstadially transmitted by the nymphs and adults of the brown ear tick called *Rhipicephalus appendiculatus*. The tick picks the parasite from blood of an infected animal. Mutambo (2008) cites (Speybroeck et al., 2003) noted that the seasonal occurrence of the brown ear tick is mostly dependant on the occurrence of the adult stage of the tick. The adult tick thrives during this period because of a combination of temperature, humidity and day length. This explains the strong association between the beginning of rainy season and adult tick activity.

In Zambia due to the fact there is only one rainy season, only one generation of ticks is known to occur per year. Adults ticks occur from December to April, larvae between March and May and nymphs between May and September (Speybroeck et al., 2002) cited in Mutambo (2008). However, Mulumba et al. (2001) also demonstrated that the nymph larva stage of the tick also played a significant role in transmission of disease during the periods June to August. The infected tick transmits the *theileria* parasite into the host (cattle) during its blood meal and spreads throughout the host's body, causing the disease.

2.3.2 Tick Control

Tick control according to Kocan (1995), cited in Willadsen (2006) is the chief means of controlling tick borne diseases. Tick control is treatment that reduces exposure of livestock to the target ticks within a specific area and time (Walker, 2011). Tick control is made possible by use of acaricides which are applied on cattle by means of dipping, spraying or spot on treatments. Acaricide is a word derived from Acari which is a name given to the order where ticks and mites belong; Acaricide refers to the chemicals used to kill ticks and mites. Chemical acaricides, if correctly applied, are efficient and cost effective (Willadsen, 2011).

Dipping involves plunging into and swimming through dip tanks or vats containing aqueous emulsion, suspension or solution of acaricide. The complete or almost complete immersion of cattle during dipping ensures adequate exposure of ticks to acaricide. The main problems with dip tanks are the high cost of construction, the need for a supply of large volumes of water, the costly amount of acaricide that is required for the initial charging of a tank, and the requirement for an adequate number of cattle to use a tank to make its operation economically viable (DVS, 2011).

Other widely used methods of acaricide application involve hand or power spraying using various types of small pumps. These methods of spraying seldom achieve complete wetting and so usually result in poor tick control. They also tend to be uneconomical due to excess acaricide solution which drips off the animal. Nevertheless, if used sensibly, they offer the small scale livestock farmer the means to control ticks (DVS, 2011).

Spot treatments of acaricides to control ticks at specific body sites such as the ears or perineum have involved the treatment of these areas with tick grease (acaricide in a petroleum jelly base which can be applied with a brush). More recently, "spot-on" and "pour-on" acaricides have been available. These formulations include solvents/propellants that spread readily over the

surface of the skin and hair. The acaricides are thus applied to limited areas of the body from where they spread to other areas.

The down side of using acaricide as indicated by many studies is issues of resistance, environmental pollution and their high cost. However, according to Willadsen (2006), acaricides if used properly are effective. However, Minjauw et al., (1998) found out that the most effective ECF control was immunisation, but it cannot be used in isolation. Biological methods of tick control have been suggested by many. One such example is a study by Nyahangare, Mvumi, and Stevenson (2012) observed that *lippia javanica* a plant found in southern Africa to have acaricidal properties. However, Willadsen (2006) points out that there is no single, ideal solution to control ticks.

2.33 Impact of ECF on Small-scale Farmers

Given the outline of how ECF is transmitted and how it can be controlled, it is also important to understand the role that cattle plays in small scale farms in order to appreciate the impact of ECF. The next section reviews the literature on the impacts of ECF on small scale farmers. As earlier alluded to in the introduction, small scale farmers in Zambia are involved in mixed farming.

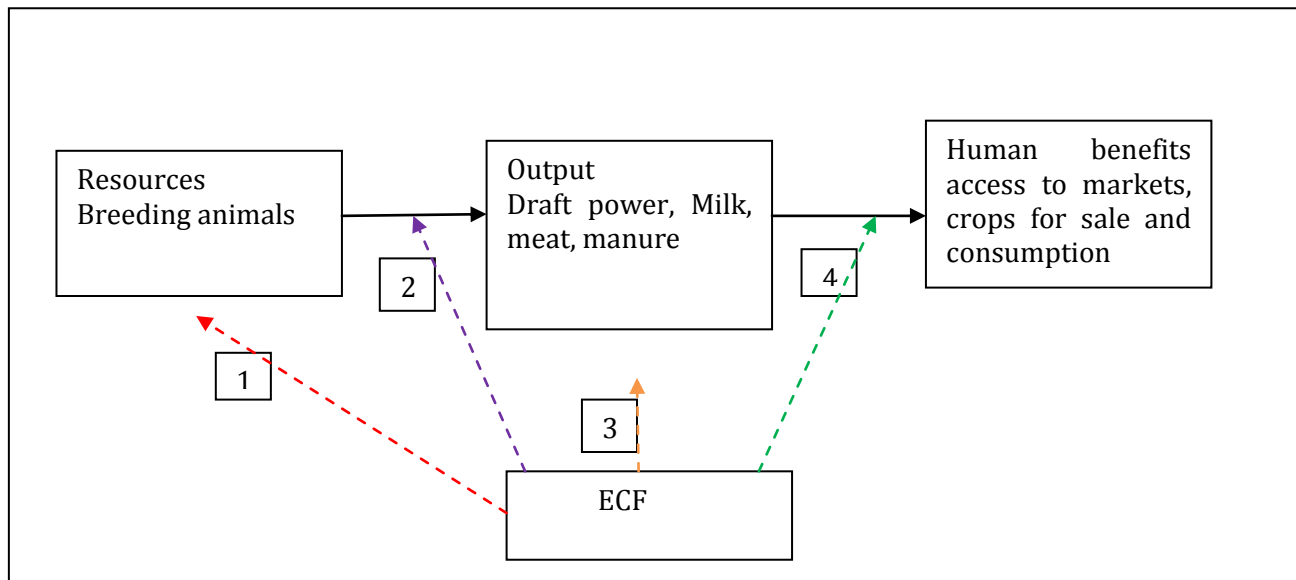
Cattle production is closely interrelated with crop production and hence plays a major role in securing household food security for the rural population. Cattle provide draught power for tillage, manure and transport as inputs to crop production. Cows usually provide milk for the cattle-owning household and sometimes also for local sale. In Zambia a significant proportion of slaughter off-take occurs within the rural communities providing meat and animal by-products to the locals (Chilonda et al., 2001). Other cattle are sold for fattening or slaughter in the commercial sector to raise cash. Investment of crop income in cattle ownership leads to capital growth as the herd grows through reproduction and hence ensures a capital base for the family in times of crop failures and drought.

Marcellino et al. (2011) observed that the effects of ECF on cattle production can be seen in two folds, the direct production losses and the indirect losses. Direct production losses can be attributed to the presence of the disease in the cattle herd through morbidity and mortality. Siddig et al (2003) cited in Marcellino et al. (2011), found the total losses due to an outbreak of tropical *theileriosis* in a dairy farm in Khartoum State to be about US\$ 62,000. Marcellino et al. (2011) in a similar study found that mortality accounted for 81.5 % of the economic loss attributed to ECF.

According to Mukhebi et al. (1992), animals which recover from ECF are likely to lose weight, produce less milk, provide less draught power and may suffer from reduced fertility and stunted growth. Indirect production losses occur when the disease acts as a constraint on the use of improved cattle which are known to be more susceptible to ECF than the local breeds.

Below is a model showing the above mentioned effects of ECF on farm production.

Figure 2: Effect of ECF on the farm productivity.



Source: McInerney (1996) cited in Otte and Chilonda (2000)

1. Shows the effect at input level. Multiplication of animals is adversely affected by loss of breeding animals.
2. It affects the animal's productivity by lowering its efficiency in feed conversion resulting in slow growth.
3. It impacts on the output of the animal, through reduced milk yields, reduced animal draft power.
4. Impacts on crop production and loss of income from the sale of animals and animal products.

Having reviewed the impact of ECF on farm productivity, it is imperative to look at the most important aspect of its impact. Most rural farmers in Zambia are subsistence farmers who rely on producing their own food. This brings the concept of food security to the fore of the discussion. What is food security for the small scale farmers?

2.4 Food Security Concepts

The definition of food security has evolved many times over the years. In 1974 when food security was first defined during the World Food Conference, it was equated to dietary energy sufficiently related to adequate food. This definition basically equated food security to adequate food production at global and national level. This was later found to be a deficient way of defining food security as research by many, showed that food insecurity could occur even in the midst of plenty. Notably Amaartya, in 1981 initiated the paradigm shift that moved the issue of access of food to the centre stage (Devereux and Maxwell, 2001). Research found that increase in food production alone did not guarantee access to food by all. Access to food is partly determined by food prices and food distribution systems.

Hence the term food accessibility was added to the definition of food security. The now widely agreed definition of food security is the one that was redefined at the World Summit of Food Security of 2009, which states that the "four pillars of food security are availability, access,

utilization, and stability”; it was emphasized that “the nutritional dimension is integral to the concept” (FAO, 2009).

In 1996 a related concept to food security was tabled at the World Food Summit, food sovereignty.

“Food sovereignty is a pre requisite to long term food security). Long-term food security depends on those who produce food and care for the natural environment. Food sovereignty is the right of each nation to maintain and develop its own capacity to produce its basic foods respecting cultural and productive diversity. We have the right to produce our own food in our own territory. Food sovereignty is a precondition to genuine food security (Via Campesina, 1996).”

This concept takes into account the rights of producers to participate in policy decisions which were generally left out in the definition of food security. It is undeniable that government policies have an impact on food security such as access to land, provision of extension services, credit, and fair trade .In this paper the two concepts will be combined, hence food security will be defined as the ability of households to produce their own staple food and in their own territory, have access to food by having sources of incomes in form of livestock sales and crops to purchase what they cannot produce themselves. Food utilization will not be discussed as it is outside the scope of this study. However, future research may look at how cattle diseases impact on household utilization of beef and milk products.

CHAPTER 3-RESEARCH METHODOLOGY

3.1 Introduction

This chapter discusses the area of study, selection of the respondents, research methods applied for collection of data, and tools of analysis. The first section of this chapter will describe the study area and selection of respondents while the second and third section will discuss the research methods and methods of data analysis, respectively.

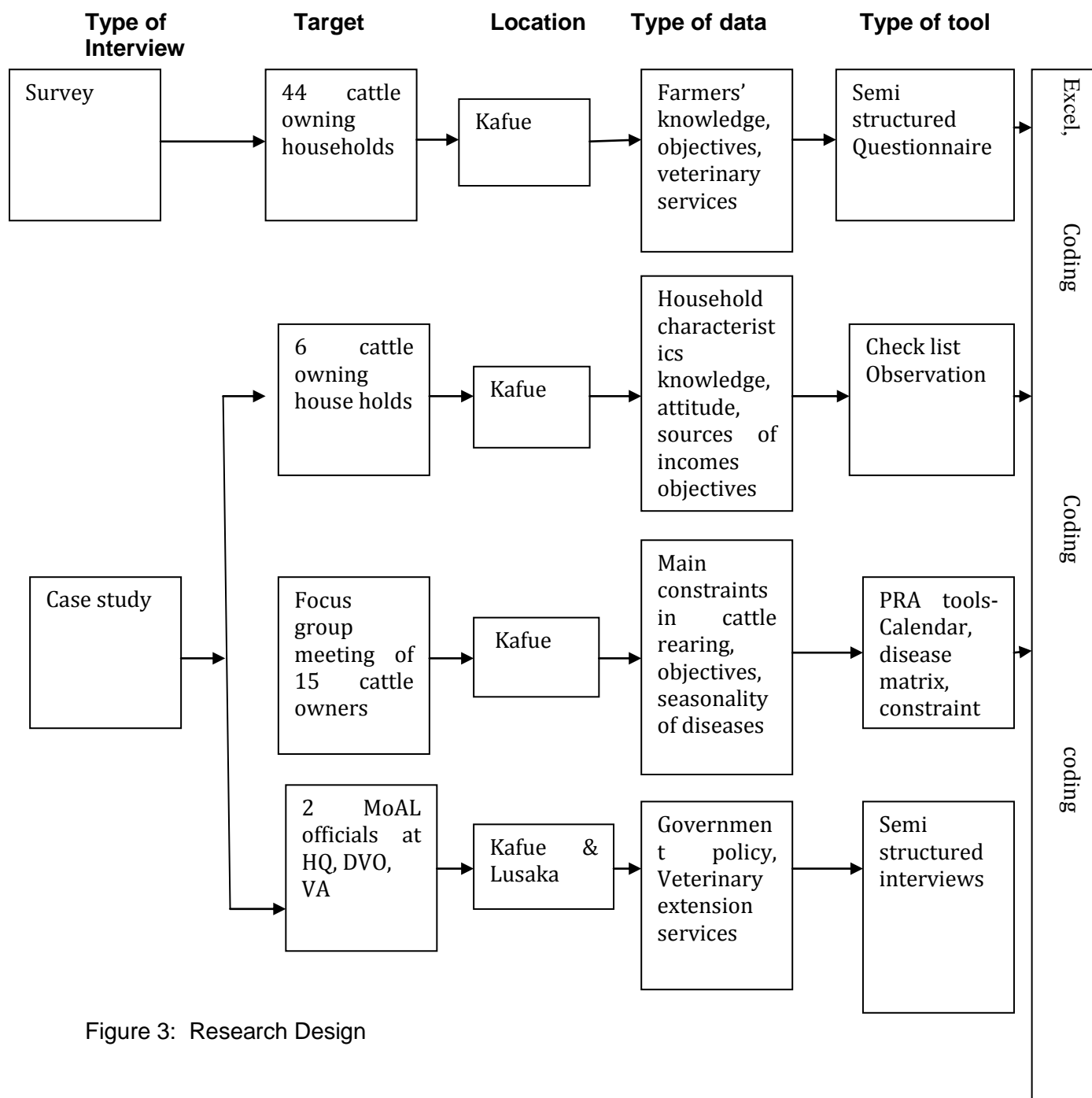


Figure 3: Research Design

3.2 Selection of the Study Area

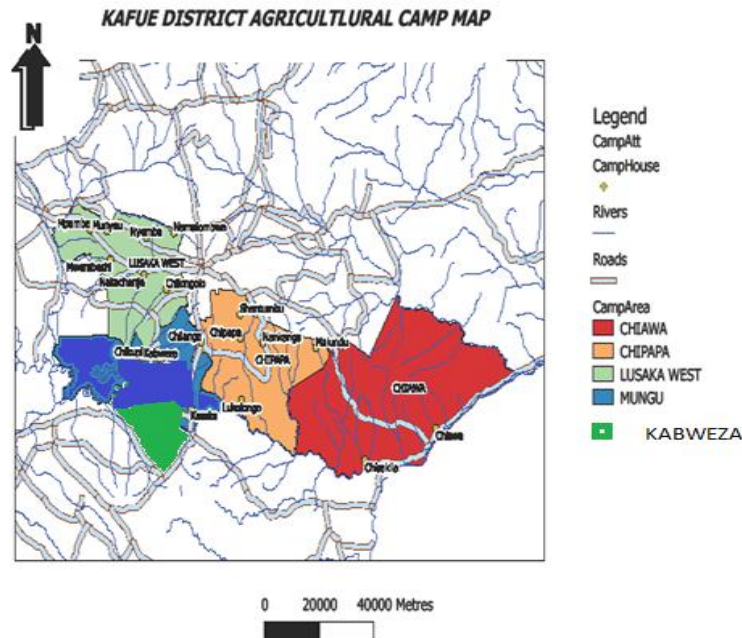
Kafue was selected because it has experienced major problems in livestock diseases and yet has attracted little attention from researchers. According to DVO's second quarterly report, ECF accounted for 65% of all reported cattle diseases in the district.

Kafue district which inhabits mostly small scale farmers has a high potential for agriculture in terms of cattle and crop production. It is located about 45km from Lusaka, a factor which was put into consideration as it was easy to access. Finally it was important for the researcher to do the study in a place where language was not a barrier.

3.3 Area of Study

Kafue district is one of the districts located in Zambia's Lusaka province. It has a population of 242,700 (CSO, 2010). It is divided into five veterinary camps, each managed by a Veterinary Assistant (VA) who is supervised by the DVO. The camps are namely, Chipapa, Lusaka west, Kafue central, Chiawa and Chilanga. Respondents in the study were selected from two wards, namely Mungu and Kabweza which are both located in Kafue central veterinary camp. Kabweza ward has a total of 436 households of which 52 own cattle. Mungu ward has a total of 214 households and the number of cattle owners at the time of the study was not known.

Figure 4: Map showing study area



Source: Kafue DVO (2012)

3.4 Selection of Respondents

A total of 45 cattle owners were purposefully selected from three zones in Kafue Central Veterinary camps. Fifteen were selected from the list of farmers who use the local dip tank, another fifteen who live in Kabweza but do not use the dip tank and fifteen from Mungu.

The respondents were selected with the help of the dip tank treasurer who had a register of all farmers who utilise the dip tank. The fifteen farmers were selected from a list of 45 farmers in the register. With the help of two farmers, cattle owners living in Kabweza but not making use of the dip tank were selected.

For the selection of respondents from Mungu, the zone chairman was used to identify 15 cattle owners.

3.41 Research Methods

A combination of qualitative and quantitative research methods was used. The method of combining research methods in collecting data can serve for the validation of the data findings. It also produces a more coherent and complete picture of the investigated domain, than mono method research can yield (Kelle, 2006). The tools used were structured questionnaires, semi structured interviews and a focus group discussion where Participatory Rural Appraisal (PRA) tools were used.

3.42 The Questionnaire

In this study as earlier mentioned a questionnaire was one of the tools used in the collection of data. The advantage of a questionnaire is that it allows collecting information such as age and household sizes which can be compared across the sampled population. A questionnaire allows the researcher to arrive at more objective conclusions by minimising subjectivity of judgement (Matveev, 2002).

A comprehensive questionnaire was designed to obtain basic information about the households. Major sections of this questionnaire study were on characteristics of the household heads, objectives of keeping cattle, main constraints, and knowledge on ECF as well as accessibility to veterinary services. The questionnaire was pre-tested in two households and necessary changes made to improve its clarity. Interviews were conducted by the researcher, the local VA and two research assistants.

The questionnaires were administered to the head of the household. It was administered in Nyanja (the local language is Tonga) which is not the local language but was commonly spoken by all involved in the study i.e. the respondents, the researcher and the research assistants. To maintain consistence, questions which required ranking were designed in a closed format. In cases where the set of expected responses was deemed not exhaustive, an option for “others: please specify” was provided. However, when a numerical response was expected, open – ended questions were used.

The questions were designed to identify and rank various livestock production constraints and the disease control strategies.

3.43 Focus Group Discussion and Participatory Rural Appraisal (PRA) Tools

A focus group discussion was also used to obtain an overview of the cattle disease situation in the study area, constraints of cattle rearing and objectives. During these discussions PRA tools were employed to give a visual picture to the discussions. These were namely, the seasonal calendar, objective and cattle diseases ranking matrix.

The use of PRA tools to collect data concerning livestock diseases is supported by Catley and Mariner(2002). They wrote that there was substantial evidence to show that PRA methods produce information which accurately describes local perceptions of animal health problems. They further observed that the methods are relatively resource friendly and can be easily

adapted at field level to suit particular circumstances. Chambers (2007), in the same vein posits that the credibility of what is learnt through participatory approaches and methods is increasingly recognised. Information and insights from participatory research have a richness and authenticity of bringing forth details that give them special authority.

For the cattle diseases matrix, the respondents were asked to name the common cattle diseases in their local language. With the assistance of the VA the diseases were written on A3 colour paper, assigning one box to each disease. Using maize grains the farmers were asked to rank the diseases. This was done by putting the number of grains in the box of the disease they perceived most important disease and the least number of grains to the least important. The researcher encouraged, especially women who seemed reluctant to take the first step. When all the respondents had participated in putting the grains, the researcher asked them to discuss whether or not it was a true picture of the prevailing situation. When it was agreed a picture of the matrix was taken.

The procedure was repeated for the calendar a PRA tool used to depict events and trends in months or years. In this instance it was used to depict the time of year when the community most experience cattle deaths. Months of the year were written on a piece of A3 paper, and again the farmers were asked to place maize grains in the months of the year when they noticed deaths among their cattle.



Picture 1: Researcher, with VA and some farmers during selection of respondents

3.44 Interviews

Semi structured interviews were conducted in order to have an understanding of the institutional setting which could have a bearing on farmers' decisions with regards to ECF control. Semi structured interviews were used in the study because they are beneficial for both interviewer and the one being interviewed. In semi structured interviews, the interviewer prepares his/her questions prior to the interview and thus is able to direct the interview. On the other hand, the respondent is able to give answers in his own words. Semi structured interviews help the researcher to determine a more holistic nature of the situation being investigated (Matveev, 2002).

The Chief of National Livestock Epidemiological Information Centre (NALEIC), Chief Veterinary Officer (CVO), DVO and the VA were considered to be key informants. The main objective of interviewing them was to find out about veterinary extension services, government policy with regards to ECF and suggestions on how ECF prevalence can be reduced. During the time of the study, the veterinary department had a one day conference which had the aim to discuss issues pertaining to ECF control in Zambia. The researcher saw this as an opportunity to gather information about ECF prevalence as well as government policy on its control.

In depth interviews were also conducted by selecting two respondents from each area. This was done during the time of collecting information using the questionnaire. The selected respondents were probed further on their ECF control regimes, and their main sources of income. In the light of maintaining consistency, the researcher conducted all the in depth interviews.

3.5 Data Analysis

Given that the data collected in the study was both in qualitative and quantitative form, two methods of analysis were employed.

For qualitative data, the responses to the interview and focus group questions were all typed in Microsoft word 2007. Each question was given a colour code and its response from all the different groups of respondents was given the same font colour. This helped to identify the different narratives belonging to each question. The information was then checked for similarities, relationships and differences among the different groups and a narrative of the obtained view was noted.

The quantitative data obtained from the questionnaire was entered in Microsoft word excel 2007. The respondents, were divided into clusters of three i.e., Kabweza D, Kabweza ND, and Mungu.

3.6 Limitations of the Study

Some household heads could not be reached as they were required by the Ministry of Agriculture and Livestock to open bank accounts in Kafue town, in order to be paid for the maize they had supplied to FRA. We instead requested the farmers we had managed to interview to invite other cattle farmers. This could have affected the results as it is possible that the ones interviewed lived in close proximity to each other and factors affecting them such as access to the dip tank and veterinary services might not necessary be the same as those we intended to interview. In some cases, women whose husbands were not available for the interview could not answer the questions as traditionally cattle keeping is mostly for men. In such cases the household had to be replaced by another household whose household head was around. In other cases, a repeat interview had to be scheduled.

The other limitation was that the veterinary camp officer of the area was one of the people organising for the researcher to meet the farmers. This could have affected their responses regarding accessibility to veterinary services.

Another limitation was that land measurements were different among the farmers. Some measured in terms of yards, others in acres and others by counting their steps. Hence that part of the research concerning land size which appeared in the questionnaire could not be included in the analysis in order to avoid inaccuracies.

3.7 Ethical Consideration

Before commencing any interviews, the researcher was introduced to the farmers as a student who had come to learn from them. The farmers were then assured that the information given during the interview would not be in anyway shared with anyone. That it was solely for the purpose of the study, and that any information given would not in any way be associated with them. They were shown that the forms had a code rather than their names.

This was necessary as it was perceived by the researcher that information given about the operations of the veterinary service might impinge on the relationship farmers have with the local veterinary service staff.

CHAPTER 4 -FINDINGS

4.1 Characteristics of Respondent

Table 1: Farmer Characteristics (house hold heads) -knowledge, education, ECF control strategy

Variable	¹ KabwezaD(n=15) Frequency (%)	² KabwezaND(n=14) Frequency (%)	Mungu (n=15) Frequency (%)
Level of education			
No formal education	2(13)	0(0)	2(13)
Primary school	10(67)	11(79)	9(60)
Secondary and tertiary education	3(20)	3(21)	4(27)
Knowledge of ECF transmission			
yes	7(47)	6(43)	7(47)
Not sure	8(53)	8(57)	8(53)
Method of tick control			
dipping	15(100)	0	0
spraying	0	14(100)	15(100)
Do not spray	0	0	0
Tick control regimes			
Weekly	15(100)	6(43)	8(47)
Not regular	0	8(57)	7(53)

Table number 1 shows that most of the respondents had a primary school education, Kabweza D (60%), Kabweza ND (78.5%) and Mungu (66.6%). Among respondents from Kabweza D and Mungu, 13.3 % had no formal education, while Kabweza ND respondents all attended formal school. In all three clusters those who knew how ECF was transmitted accounted for 47% in Kabweza D, 43% for Kabweza ND and 47% for Mungu.

All farmers were involved in either dipping or spraying with 68% using spraying as a method of controlling ticks. All the respondents that dipped their cattle said they dipped on a weekly basis, while 57% and 47% of the respondents from KabwezaND and Mungu did not spray regularly.

¹ KabwezaD-represents the respondents in Kabweza who use the local dip tank

² Kabweza ND-represents the respondents in Kabweza not using the local dip tank

Table 2: Farmer characteristics- Age, experience and household size

Variable	KabwezaD(n=15) Average(range)	KabwezaND (n=14) Average(range)	Mungu(n=15) Average(range)
Age	51.5(23-82)	46.6 (40-70)	49.2 (32-66)
Experience of keeping cattle (years)	27 (4-63)	19(3-50)	20(5-40)
Household size	9 (7-15)	9 (5-20)	7 (3-15)

Table 2 shows that the average age of farmers in Kabweza D was 51.5, while Kabweza ND and Mungu respondents had 46.6 and 49.2 years respectively. Kabweza D and Kabweza ND had an average of 9 people per household, while Mungu had an average of 7 people per household. The majority of the respondents reported that they had been keeping cattle for more than 10 years, with some having more than 40 years experience.

All respondents were found to be involved in dipping and spraying regardless of the age, knowledge they had about ECF and level of education. In depth interviews indicated that apart from the fact that most farmers had witnessed a reduction in cattle deaths attributed to dipping and spraying, many also participated in dipping and spraying because they feared being scorned by the community for bringing the disease into the area by not spraying or dipping their cattle.

Most respondents were not sure that ticks were involved in the transmission of ECF. The respondents gave varying answers when asked how ECF was transmitted. Most of respondents believed it was transmitted by getting in contact with sick animals, while others attributed it to eating fresh grass. Two respondents said the disease was as a result of being poisoned while grazing in cotton fields. It was also observed that most women in the study were ignorant about ECF and its control.

During the interviews and also in the questionnaire most respondents were able to identify ECF by outlining both clinical and post mortem signs; however a few described other signs which were associated with other diseases, such as sloughing of the skin and confusion. All respondents knew that ECF could be controlled by dipping or spraying, although some thought dipping was used for treatment.

There was a lack of knowledge among the respondents on how to spray the cattle. During interviews it was evident that the respondents used less acaricide per animal than the recommended 10 litres per animal.

"We spray 6 animals for one sprayer that is a 16 litres sprayer."(Interview with case number 3)
The VA noted that spraying was usually left to children who might not be able to know the right concentration of the acaricide to be used. He reported that some farmers used one sprayer to spray a whole herd of cattle. The VA also reported that another contributing factor to poor adherence to recommended acaricide is farmers' reluctance to attend meetings organised by the veterinary service. He observed that the household heads sent either their children or their herd's men to attend the meetings. This resulted in missing out on information such as the right way to spray and hence rely on their knowledge.

"During my visits to the farms the herd's men who attend meetings complain about the farmers' reluctance to purchase the right amount of acaricide to be sprayed on the animals. When the herd's men tell them how much acaricide is required they feel they are being cheated. This is why they do not spray their animals properly."(Interview with VA)

However in depth interviews with most respondents revealed that they rarely had meetings with the VA concerning ECF control. Most relied on information from their neighbours concerning information on how to mix the acaricide.

Spraying of cattle is usually done by men, most often by the household head. The cattle are confined in a small area and the animals are sprayed at random. In the absence of the household head, the older boys in the household or hired herd's men will carry out the job.

In female headed households, an adult male if available will be in charge of spraying or taking the cattle to the dip tank. A widow (case 6) who owns 4 cows revealed during an in depth interview that she is helped by older boys from the neighbourhood but sometimes she has to hire someone to do it for her. This entails that during the time when labour is inaccessible she is unable to spray or dip. She confessed to being ignorant about how to mix the acaricide and called spraying a "man's job".

4.11 Respondents Objectives

Table 3: Respondents' objectives for keeping cattle

Objective	Kabweza(D) n=15	Kabweza(ND)n=14	Mungu n=15
Animal draft	1	1	1
financial security	2	2	2
income generation(sale)	3	3	3
food(milk/meat)	4	4	4
social status	5	5	5
Means of transportation	6	6	6

The information in table 3 was obtained from the questionnaire. The respondents ranked the different objectives from 1-6, with the score of 1 being given to the most important objective and the score of 6 to the least important. The mean score of each objective was taken as the ranking. The table shows that the objectives were ranked the same in all the three areas. The main objective for keeping cattle was animal draft power. Financial security was ranked second. During the focus group discussion the respondents pointed out that they used animal draught power for cultivating their crops.

During the interview with case study 3, she stated the following:

"The soil here is too hard to cultivate with a hoe. So the main reason for keeping cattle is cultivation of maize and other crops. We also use cattle for hiring to those who do not have animals to help them work the land. We charge ³ZMK150, 000 for every twenty by twenty meters. (Interview with case 6)"

"Denkete has wiped out a lot of animals and made people's lives very hard. It is difficult to cultivate without cattle. Losing our cattle means hunger for us. The ones who have no cattle are worse off because they need to hire animals for draught power or make do with hoes. They can only produce very few crops that way."(Focus group meeting)

Financial security was ranked second as an objective for keeping cattle. Cattle are kept as a 'bank'. The farmers sometimes use incomes from the sale of cash crops to buy cattle as a way of keeping cash. They also use cattle for securing the future of their children. Either by paying

³ At the time of the study ZMK K5000 was equal to \$1

school fees in hope of them getting formal employment or stopping them going to school and giving them cattle to set them up in farming.

"Cattle are the biggest asset we have. Sometimes we sell animals to pay school fees for our children, other times when we realise that the child is not intelligent enough to finish school with good grades, we give him a cow. Because we know once he has a cow he can afford to take care of himself by cultivating his own land." (Interview with respondent)

The focus group also pointed out that cattle were used for solving many different types of problems such as settling disputes, cases of adultery, payment for impregnating a girl before marriage and buying food when there was crop failure. The cultural roles of cattle were their use in payment of bride prices and honouring an important person by killing an animal during his funeral. Cattle were also used as a means of transport to take crops to the market.

Social status was found to be the least among the objectives for keeping cattle, which was different from how it was rated in the questionnaire. In the focus group discussion it was ranked to be less important than using cattle for transport.

"We do not keep cattle for social status", cattle is our means of survival". (Focus group discussion)

One farmer pointed out that eating meat was rare unless during a funeral or when an animal was very sick and it had to be slaughtered.

When asked whether beef consumption was one of his objectives for keeping cattle the respondent made the following comment.

"It's funny that people in the city eat meat more often than those of us who produce it. I personally have not eaten meat in a long time."(Case number4)

4.12 Respondents main constraint of cattle keeping

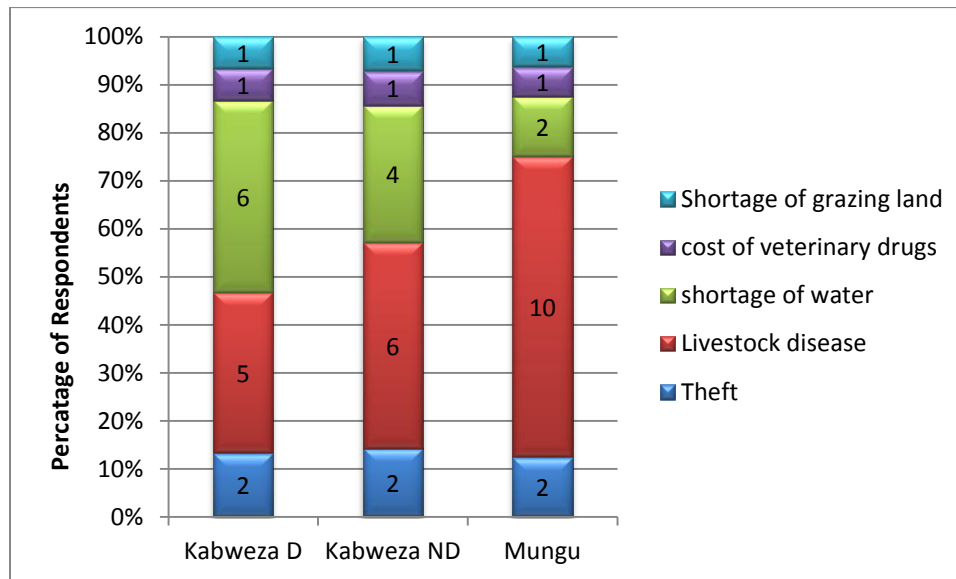


Figure 5: Bar chart showing respondents major constraint

According to figure 5, livestock diseases were the main constraint for KabwezaND (43%) and Mungu (60%). The biggest constraint for KabwezaD respondents was shortage of water (40%). The second biggest constraint for Mungu (20%) and KabwezaND (29%) respondents was shortage of water. Other constraints were theft, shortage of grazing land and cost of veterinary drugs.

It was noted during the study that there was only one community borehole in Kabweza and one in Mungu providing water for the locals. The respondents complained of having to use the boreholes for watering the animals, as well as for house hold purposes.

Case number 1 reported that during the dry season they are forced to send the animals to the Kafue flats for accessing water as well as grazing.

During the focus group meeting water, was mentioned as the second biggest constraint after cattle diseases. The respondents complained that there were inadequate boreholes in the area. Some had resorted to digging shallow wells. The water sources had to be shared with the animals especially during the dry season.

The respondents revealed that water scarcity made it difficult to spray the animals. The respondents in Kabweza who used a dip tank, had less of a challenge with water since the dip tank is just next to the community borehole. The respondents from KabwezaND found it to be more of a challenge since they relied on knapsack sprayers. According to the VA and some respondents, Kabweza is considered to be the dry area of Kafue, whereas Mungu is closer to the river.

These results indicate that location of the respondent's farm had a bearing on the ability to dip or spray. KabwezaD who were closer to the dip tank and community borehole and Mungu respondents who had less of a challenge in accessibility of water were more regular in dipping and spraying than those in Kabweza D.

4.2 Characteristics of Respondents' Farms

This section presents the results related to the characteristics of the respondents' farms. Most were found to produce more than one crop. Most homes visited had maize stalls built within their homesteads.

Table 4: Cultivated crops

	Kabweza(D) n=15	Kabweza(ND)n=14	Mungu n=15
Crops cultivated			
Maize	15	14	15
Other food crops only	7	4	10
Food crops and cash crops	8	10	5
Cash crops only	0	0	0

Table 4 shows that all respondents cultivated maize. Most farmers cultivated more than one crop. Other food crops were sorghum, beans, cow peas, sweet potatoes. These were cultivated by 7 respondents in KabwezaD, 4 in KabwezaD and 10 in Mungu. None of the respondents cultivated cash crops alone.

The cash crops cultivated were cotton, soya beans and sunflower. During the interviews the respondents reported that they cultivated the crops for their own consumption, cash crops were cultivated for income generation to pay school fees for the children and meet other house hold needs such as food and clothing. During in depth interviews some respondents indicated that they use some of the proceeds from the sale of cash crops to buy acaricide.

Apart from maize the farmers also grew other food crops namely, cow peas, beans, groundnuts and sweet potatoes, which were mainly grown for consumption.

Table 5: Livestock numbers

Type of Livestock	Kabweza n=15 Average per HH	KabwezaND n=14 Average per HH	Mungu n=15 Average per HH
Cattle	10	11	12
Goats	9	11	10
Chickens	14	13	17

Table 5 shows the average number of animals owned by the respondents in the different areas. The most popularly owned livestock were goats and chickens. The pattern of livestock ownership was the same in all areas. Mungu respondents had the most number of livestock per house hold.

During the in depth interviews as well as the focus group meeting the farmers reported that they keep goats and chickens for quick sales. Case 2, said that he sometimes sold goats and chickens to buy acaricide.

Most farmers indicated that their main source of incomes were sale of cash crops and small livestock.

4.3 Respondents Economic Factors

During the interview with the VA, he reported that farmers had no access to markets for acaricide. Most farmers relied on him to supply them with acaricides and drugs which he bought from Lusaka as the few suppliers in Kafue were very expensive.

The respondents confirmed this and complained of inability to access the markets during the rainy season as the roads became impassable.

During the in depth interviews most farmers admitted that they sprayed once a week when the acaricide was available, otherwise sometimes they sprayed once a month. Their main source of incomes as alluded to earlier were from sales of crops and small livestock.

Most respondents considered purchasing acaricide as an extra cost rather than a priority. However when they had problems in the herd they would find money to buy acaricide either by selling chickens or a goat or borrowing from a neighbour. They bought mostly 1 litre or 500ml bottles which were cheaper and sprayed the cattle sparingly in order to economise.

Figure 6: Respondents views of acaricide prices

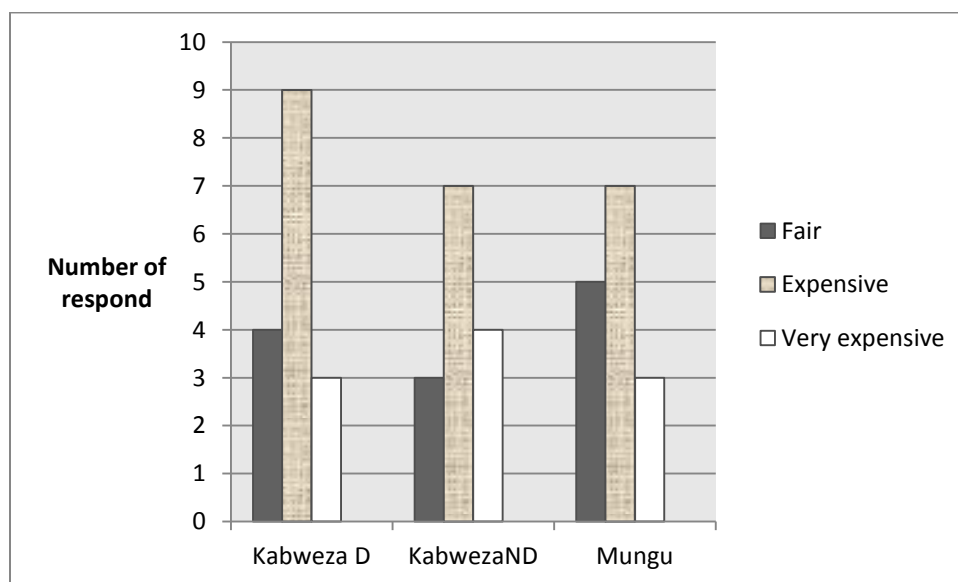


Figure number 6 shows that most respondents (23) found the acaricide to be expensive but affordable. 10 respondents found the price of acaricide to be very expensive for them to afford.

During an in depth interview with case 4 who said the drug was too expensive, revealed that he found it cheaper to buy the acaricide as a group. He also noted that most of the drugs had to be bought from Lusaka because the suppliers in Kafue were few and expensive.

Some respondents also pointed out that credit facilities were lacking in the area to purchase the acaricide when house hold incomes were low. Those who were termed 'better off farmers', were able to get money from other income sources such as money from their children in the city and off farm incomes.

One farmer who made bricks as an off farm activity said he was able to buy acaricide every month from the money that he made from the sale of bricks. Another farmer said he got help

from his son in Lusaka who bought acaricide every month otherwise he would not manage to buy the acaricide.

One respondent during an interview indicated that spending money on acaricide every week was not easy because sometimes they did not have money to purchase it.

“When we buy we make sure it lasts as long as possible”.

“Sometimes when we do not have money we use ⁴Mululwe, to prevent the animals from dying from Denkete” (case number 5).

The above results indicate that farmers’ decisions on the rate of dipping and spraying are influenced by availability of income sources as well as the price of the acaricide.

⁴ Mululwe is a tree, the bark is boiled and cattle are made to drink it

4.4 Institutional Setting in Kafue

This section presents the results with regards to the veterinary service delivery in Kafue, dipping infrastructure as well as government policy on extension services and ECF control.

4.4.1 Veterinary Service Delivery

During the interview the VA pointed out a number of challenges facing the veterinary department in the district. He reported that Kafue central camp like many other camps in the district was too vast to be managed by one VA. He suggested that the camps should be split into more manageable units. At the time of the study he estimated the number of farmers under his management catchment to have not less than 800 households. Other challenges were inadequate funds to carry out extension work. He reported that sometimes months elapsed without giving any training to farmers. Most of the visits made to farms are to treat sick animals or give vaccinations (Black leg and Anthrax). Lack of transport was also cited as a challenge, especially during rainy season when the roads were impassable even with the motor bike.

Table 6: Dipping /spraying regimes and access to veterinary services

Veterinary service provider	Kabweza n=15	KabwezaND n=14	Mungu n=15
Government	15	11	15
Private	0	0	0
None	0	3	0
Visits by VA in 3 months			
Visited	2	5	12
Not visited	13	9	3

The table also shows that government was the only provider of veterinary service. All except three farmers used the local VA. All respondents except three from Kabweza ND use veterinary extension services provided by government. Kabweza ND had the highest number of respondents not visited by the VA.

The VA revealed during the interview that he visited the farmers in KabwezaD because they had formed a group and hence were easier to work with.

“When they want their animals treated or vaccinated, they call me and I attend to them all at once.”(Interview with VA)

4.42 Veterinary Information Delivery

Dissemination of information is one of the roles of extension services. The ranking of information source was to gain an insight on where the farmers obtained their information concerning ECF. The respondents were asked to rank the various information sources by giving scores 1-5. The most important information source was given a score of 1, while, the least important had a score of 5. The mean score was regarded as the ranking for the information source.

Table 7: Ranking of information sources

Information source	Mungu	Kabweza ND	KabwezaD
Government VA	3	3	1
Private veterinarian	-	-	-
Neighbour	1	1	3
Radio	2	2	2
News paper	-	-	5
Family	4	4	4

Table 7, illustrates how the respondents ranked the information sources with regards to ECF. The respondents from KabwezaD ranked the government VA as the main source of their information with regards to ECF, while those from Mungu and KabwezaND relied more on their neighbours and the radio for information. The VA was ranked third by both Mungu and KabwezaND respondents. Only one respondent mentioned using newspaper as a source of information.

Kabweza D respondents depended more on the VA for their information. This was also confirmed by the VA who reported that that he visited the farmers who dipped their animals at the dip because they had formed a committee and hence could easily be visited all at once, especially during the time of vaccinations or when there was an outbreak in the area. The VA and respondents reported that this service is paid for at an agreed price. The VA disclosed that it was cheaper to visit the farmers at the same time because he used his own fuel to make the farm visits. Most of the farmers visited were those who were able to pay for the services.

This result indicates that farmers' decisions with regards to ECF were mainly influenced by the information they obtained from their neighbours rather than the government VA. In depth interviewed revealed however that the information obtained from the radio was mainly focussing on announcement of out breaks, hence played a role of warning them rather than informing them on how to prevent the disease.

4.43 Dipping Infrastructure in Kafue

The DVO revealed that Kabweza dip tank was the only dip tank in Kafue central camp and the only one functioning in the district at the time of the study. It was built by government during post independence period during the time government was involved in construction and maintenance of dip tanks.

The observation made during the field visit was that those who dipped where closer to the dip tank. The respondents in Kabweza who sprayed their cattle lived in villages which were further away from the dip tank. This is indicative of the fact that distance to the dip had an influence on farmers' decisions to either dip or spray their cattle. Those who lived further from the dip reported that they preferred to buy their own acaricide and spray at their own time.



Picture 2: Kabweza dip tank

Box 1: Interview with dip tank treasurer

The farmer who was former Member of Parliament (MP) is the one who rehabilitated this dip tank. He has many animals which use this same dip tank. Since the dip tank was rehabilitated two years ago he buys the dip chemical and we pay him back half of the amount we collect from the dipping fee which is K200 per animal. But this money is not enough. Every week we dip we need to add some more dip chemical. Farmers are also requested to contribute to put water in the tank. We normally contribute six drums of water per household. Water is drawn from the bore hole which is close to the dip. It is the only borehole we have in the area. This job is usually done by children in the households. Those who do not have children hire their neighbours' children and pay them K1000 per drum.

About two months ago, we requested the members to pay K30, 000, but only 15 people have paid, the others have stopped bringing the animals for dipping...Honestly is K30, 000 too much money to pay for an animal that works for you?' she lamented. We decided as a committee to increase the fee per animal to K500 so that we can meet the cost of the acaricide. The farmer says he cannot continue buying the chemicals without full commitment from the other farmers. K380, 000 per 5liters of acaricide per week is what is needed for the dip tank.

4.44 Government Policy on ECF

According to the Chief Veterinary Officer (CVO), a colossal amount of money is spent on control of Foot and Mouth Disease (FMD), which apart from being a hindrance to beef exports and a trans-boundary threat to neighbouring countries; mortalities levels are very low in comparison to ECF. The problem of ECF increased in 1991 when there was policy change concerning control of ECF. The government seized the provision of inputs to farmers and maintenance of the dip tanks.

One of the key informants reported that the change was done in haste and without proper consideration of how the farmers would be affected. ECF since then until recently was named a management disease rather than a disease of national importance.

"This move by government contributed to a drastic decline in cattle population in the year 1991. Most dip tanks in the country are not operational due to being dilapidated and vandalised."(Interview with key informant)

The motive was to reduce government spending in agriculture and liberalise the veterinary extension services. The roles of government are confined to disease surveillance, control and prevention of diseases of national importance such as Contagious Bovine Pleural Pneumonia (CBPP) and FMD.

The policy of making ECF a management disease has left farmers to rely on their own resources to control the disease. This has led to each farmer having to make his or her own decisions on how to control the disease, with very little direction from DVS.

However a key informant explained that it was agreed in 2010 through an act of parliament to rename ECF as a disease of national importance and make dipping compulsory. The plan is for government to rehabilitate all the dip tanks, construct new ones in the districts known to be prone to outbreaks of ECF. Spray races have been purchased for the same reasons; plans to demarcate camps into smaller manageable camps are also underway as understaffing has been recognised as a contributing factor to the under performance of the department. He however pointed out that little has been done over those proposals

4.45 Government Policy on Extension Services

According to government policy, the DVS is supposed to play a regulatory role and provision of technical support. A key informant reported that when veterinary extension services were pronounced as a domain for the private sector, the government veterinary practitioners

demanding that they should also be allowed to practice privately. This was due to the fact that government medical doctors were allowed to practice privately after working hours.

“But as it stands there are few private veterinarians hence the government veterinarians are doing the work, at an agreed fee with the farmer. Since there are no clear guidelines this is done even during working hours”.

“It is a conflict of interest because as it stands who regulates who? Attempts have been made to curb this trend even at Lusaka offices where money is made during working hours, but it is difficult. The government does not buy drugs anymore so when farmers are attended to by the government veterinary officers and the VAs, they treat the animals using their own drugs.”

This was confirmed by farmers who alluded to the fact that they pay for the VA's services. Some farmers when asked which veterinary service they used did not know whether the VA was employed by government or was operating privately.

In depth interviews with farmers and the VA revealed that they normally call on the VA when they had a sick animal or they wanted to have their animals vaccinated. One respondent disclosed that he had not been visited by the VA because he treated the animals himself and he had never heard of any meeting organised by the government veterinary office. Most farmers reported that they called him only when they were able to pay for his services.

These findings indicate that farmers' decisions were not influenced by the VA, as extension services were mainly used as 'ambulance service' for treatment of sick animals at a fee.

4.5 Biophysical Factors Affecting ECF Control



Picture 3: Cattle disease ranking matrix

Picture 3 shows the main livestock diseases in Kafue. Denkete (ECF) was sighted as the biggest challenge among cattle diseases. Other diseases of notable challenge were Black leg and Lumpy skin disease (LSD).

Figure 7: Calendar showing number of cattle mortalities and morbidities due to ECF



Figure 7 is the PRA tool that was used to describe the number of cattle getting sick or dying due ECF.

The farmers observed that most cattle deaths and illnesses occurred in the rainy season from November to April. They also observed that there were two peak periods for cattle deaths, one in November and the other in April. Some respondents also noticed that during the rainy season there was an increase of brown ticks on the animals.

Some farmers indicated not dipping in the dry season because they noticed the number of animals dying or getting sick were less during the dry season. Those who were aware that ticks were involved in the transmission of ECF reported that they reduced the frequency of spraying during the dry season because of reduced tick numbers.

However 'better off' farmers who had boreholes operated managed to spray their animals even in the dry season. The ones who had less access to water reduced the frequency of spraying to once a month.

Farmers decisions with regards to dipping were also influenced by the type of cattle breeds they own. One farmer who owns mixed breed (local breed crossed with Boran) indicated that he sprayed his cattle once a week in the dry season and sometimes three times in the rainy season because he noticed his cattle were more susceptible to the disease than the local breeds.

"These local breeds can have many ticks on their bodies, but they will not die, mine easily get sick and die if not sprayed" (interview with respondent).

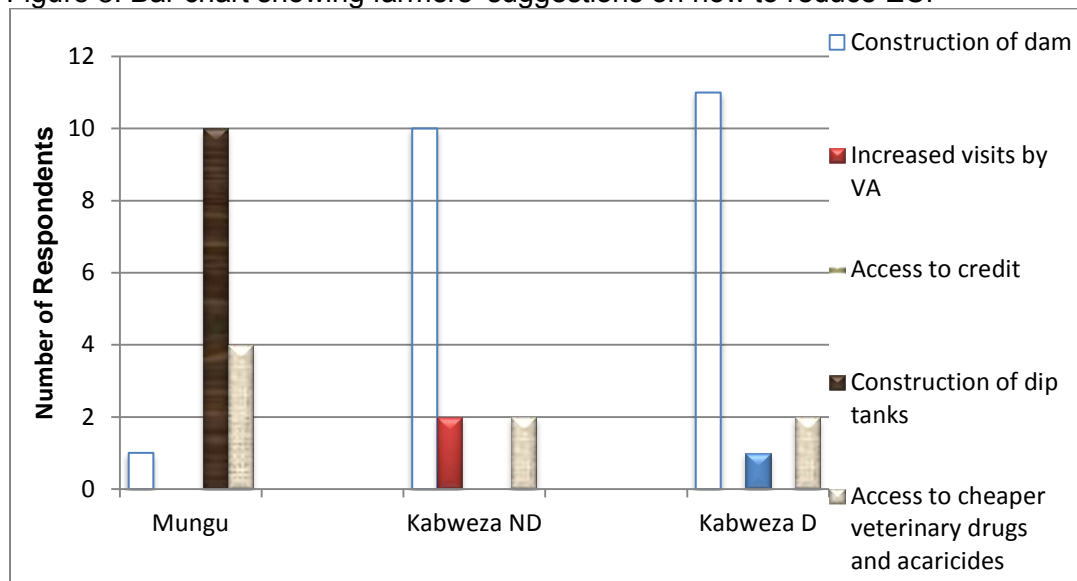
During the in-depth interviews some farmers indicated that due to scarcity of water they reduced the water and increased the concentration of acaricide.

These results indicate that seasonality as well as breed of cattle influenced farmers' decisions in their rate of dipping and spraying.

4.6 Suggestions on how to Influence Decision Making of Farmers with Regards to ECF Control

It was noted that that even though respondents and MAL officials agreed that ECF was the biggest cattle challenge facing Kafue district they had divergent views on what should be done. Below is a bar chart showing how respondents answered to the question: What do you think can be done to improve the situation of ECF in your area?

Figure 8: Bar chart showing farmers' suggestions on how to reduce ECF



There were notable differences between the respondents in the different categories. Most of KabwezaD and KabwezaND respondents suggested construction of a dam to enable them to access water for dipping and spraying. Mungu respondents suggested construction of dip tanks. Access to cheaper veterinary drugs was also suggested by a total of 6 respondents, with 4 from Kabweza.

Two key informants suggested investment in laboratory equipment for district officers in order to carry out disease surveillance.

“Most diagnostics are done by observation of clinical signs without confirming in the laboratory. There is need for laboratory equipment for the district offices to be able to carry out disease surveillance as field data is very important for tackling such issues.”⁵(Interview with Key informant)

All the three informants suggested that ECF should be considered as a disease of national and economic importance as it caused more mortality accumulatively compared to other cattle diseases. The DVO added that encouraging farmers to take cattle keeping as a business can help in improve ECF control strategies.

“There is a missing link between farmer and entrepreneurship, a challenge which should be done by the department of agribusiness. But currently agric -business is working as a department attached only to the department of agriculture instead of cutting across all departments such as livestock and fisheries. This would encourage farmers to look at farming as a business.”(Interview with key informant)

⁵ For the sake of anonymity all direct quotes will not bear the interviewees' job title

He noted that most farmers who call themselves poor are not poor. He observed that a cow could be sold between \$600 and \$1000 and some farmers had more than 50 animals. He suggested that in order to remain economically efficient farmers needed to keep less than 30 animals at a time.

The Chief Epidemiologist also suggested closing what he termed an existing gap between research and extension. He noted that the gap had contributed to the poor performance of the department in coming up with strategies to counter livestock disease, as information on actual prevalence and incidences of livestock disease was lacking.

“There is need for government to invest in research through collaboration with the University of Zambia School Of Veterinary Medicine; to come up with strategies through division of the country into endemic and non endemic ECF zones. This will help in coming up with a strategy to decide on whether to go for endemic stability or eradication of the disease. Right now there is no clear policy; everybody is doing something different without giving a clear direction on where things are going.”(Interview with Key informant)

It is evident that even though farmers and MAL officials agree that ECF is a constraint to cattle production they offered different solutions to the problem, with the MAL officials having a more technical view.

Box 2: Case 1

Sex: female

Age: 42

Farming experience: 20 years

Family size: 13

Size of land: 1.8 hectares

Number of cattle: 20

Other livestock: 12 Goats, 10 chickens

Type of crops: Maize, sorghum and cotton

Purpose for growing crops: we grow maize and sorghum for consumption and also for sale when we have a good harvest. Cotton is sold and the income obtained from the sales is used for payment of school fees and solving household problems. We have six school going children. Most of our income is from the sale of cotton.

Purpose for keeping cattle: priority of keeping cattle is for financial security, we use it as a bank and also for draught power. We keep chickens and goats for easy sales and sometimes for food.

⁶Denkete is a big problem in this area we lost 8 animals last year to Denkete and two to lumpy skin. We spray but sometimes our animals still die. Like three days ago we lost an animal even after spraying.

We spray once a week but sometimes we do not spray when we do not have cash to buy the chemicals.

We spray 6 animals for one sprayer that is, a 16 litres sprayer.

Denkete is spread by animals getting into contact with other sick animals. Since this is a communal grazing area all animals graze together.

The signs of Denkete are overflowing of mucous from the nose, salivation, tears coming out of the eyes, loss of appetite and coughing.

Veterinary drugs are very expensive so this is a constraint, but the biggest constraint we have is cattle theft which has become very rampant. We are kept awake at night for fear of losing our animals. Livestock disease is also a major constraint, followed by lack of water. During the dry season, we take the animals to the swamps. From Monday to Sunday, the non going school boys take the animals to the banks of the river and camp there and are relieved by the school boys over the weekend.

The veterinary services which are only provided by the government vet are good. When we call him, he always comes. We have been visited twice because of the problem we had in our herd.

Source of information: Radio and neighbours

⁶ Denkete local name for ECF

Box 2: Case 2

Male, 43 years

Education level: secondary school

Farming experience: more than 20years

Family size: 8

Size of herd: 5

Land size: 5 acres

Crops cultivated: Cow peas, groundnuts, maize, and sunflower. Maize is mainly for consumption. Sunflower is sold to feed suppliers for incomes for household needs.

Main reason for keeping cattle is draught power and financial security.

Other livestock kept: 10 goats, 20 chickens and 4 pigs

Main purpose for keeping other livestock: unlike cattle, goats, chickens and pigs are fast growing and they are easy to sell off. We keep them for generation of income to sort out immediate needs. However out of all the livestock, cattle are the most important because they also give a certain status in the community.

The biggest constraint for raising cattle is lack of water. We only have one bore hole, which provides water for household use as well as watering livestock.

The other constraint is cattle diseases. I have lost over twenty animals due to Denkete. The deaths are usually experienced in the rainy season. Denkete is caused by ticks found on the animals.

When an animal dies of Denkete the gall bladder contents become very thick, the animal has very hard stool, and the contents of that 'stomach' with many layers is very dry. I dip every Friday at the dip tank and pay ZMK200 per animal.

Since I started dipping there has been no death of cattle due to Denkete. The main source of information is the government veterinary officer. The services provided by the vet are fair. Prices of dip chemicals are high, but what can we do? Farming is expensive. Sometimes I have to sell chickens and goats to buy dip so that my cattle do not die.

I am willing to pay, so when the government vet comes to treat my animals, I pay. The government vet has visited me more than three times because of an outbreak of disease which causes swellings all over the body and sloughing of the skin.

CHAPTER 5.0 DISCUSSION

This chapter will discuss the findings of the study in three sections. The first section will discuss internal factors that were found to influence the decisions of respondents in the study with regards to dipping and spraying. Internal factors are the farm and characteristics, while the external factors are the biophysical and the institutional factors. The third and fourth sessions will discuss food security implications and perceptions of MAL officers and farmers on how ECF situation can be improved.

5.1 Internal Factors

The study found that most farmers were unaware that ticks were involved in the transmission of ECF. This finding partly explains why farmers are not consistent with ECF control as they are unaware of what vector to target. In order for one to adopt a technology fully one needs to understand why it should be taken up in the first place.

However most were found to either dip or spray because they feared being scorned by the community. This finding is an indication that neighbours do play a role in decision making of farmers with regards to dipping and spraying.

Literacy level of the farmers and cost of the acaricide influenced farmers' decisions to use less acaricide than recommended. Most farmers in the study were found to have low literacy levels. Acaricides are manufactured outside the country and their instruction labels are usually in English which is a foreign language to the farmers. Reading these instructions and trying to follow the recommended way of using it can be a challenge to an illiterate or semi illiterate farmer. Nyahangare, Mvumi, and Stevenson (2012) also suggested that this could be an explanation for improper use of acaricides. The cost of the acaricide was also found to be a factor in farmers' decision on the dilution of the acaricide. In order to economise farmers used less acaricide and sprayed more cattle than was recommended. The other factor was that acaricide was not considered as a priority cost by most farmers. Ekoja (2008) found that farmers' decisions with regards to adoption intensity were negatively influenced by inability to afford or appropriately apply the new techniques/technologies.

Inadequate water sources were found to be an obstacle in the use of acaricide for controlling ECF, resulting in farmers deciding to use less water for dipping than was required. Chilonda and Van Huylenbroek (2001) proposed that the resources that a farm has influences farmers' decision on adoption intensity. Rogers (2003) wrote that farmer' decisions also deal with allocation of resources to different activities within the household; resources such as water, labour and available incomes. Both spraying and dipping require a colossal amount of water. In the situation where there are inadequate sources of water, for home use as well as for animal watering, collecting water for spraying might not be a priority. Collection of water which is mostly done by women and children might be seen to be an extra burden on family labour. And for families that have fewer children in their households, it is an added cost because they need to pay for labour. The study found that female headed households without male adults found it a constraint to dip or spray their cattle, as they depended mostly on assistance from neighbours as well as hired labour. Noltze, Schwarze and Quaim (2012) found that non availability of labour impacted negatively on farmers' decisions to adopt technology.

Having incomes from crop, livestock sales and off farm activities also played a role in farmers' decisions in dipping and spraying. Those farmers who had incomes from these sources were able to access the acaricide and spray more frequently than those with less income sources. Non availability of incomes also influenced some farmers to use alternative methods such as traditional herbs (Mululwe).

Social status as an objective for raising cattle was ranked among the least. This is in contrast to Mulemba (2009), who attributed farmers' reluctance to cattle being kept mainly as a status symbol. However this study found that cattle are used mainly for animal draught power and as a way of keeping their money. According to Save the Children Fund (2000), poor people often

keep their savings in form of livestock, and the interest on their 'money' comes in form of milk and labour saving using draught power. In study by Chilonda et al. (2000) in the Eastern part of Zambia also found that cattle are mainly kept for animal draught power and as a store of wealth. It was observed in the study that the farmer in Kabweza who was involved in the rehabilitation of the dip tank and whose objective was beef production was more committed to dipping than the small scale farmers. It can therefore be said that farmers whose objective for keeping cattle are market orientated are more likely to invest in animal health management such as ECF control. They are more risk averse than the small scale farmers. McDermont(1999) observed that there was a difference in the degree of intensification in animal management between dairy farmers who are market oriented and pastoralist.

5.2 External Factors

Farmers' decisions with regards to dipping and spraying were influenced by the seasonality of ECF. The study found that most cattle deaths from ECF were experienced in the rainy season from November to April. This is the period of time when Speybroeck et al. (2002) cited in Mutambo (2008) observed the activity of the vector *Rhipicephalus Appendiculatus*.

It is interesting to also note that according to FEWS NET (2012) this period coincides with the peak hunger season in Zambia (Refer to appendix 5). This has implications on the decisions farmers have to make with regards to the use of scarce resources. It means that farmers have to decide on buying food or acaricide. It is more than likely that they will make a decision to buy food. Hence seasonality in terms of food availability can be said to have an influence on the decisions of frequency of dipping or spraying.

Hence with the reduction of disease in the dry season, some farmers' decided to dip their cattle only in the rainy season, while others sprayed less frequently during the dry period. Those who knew that ticks were responsible for ECF sprayed more when they noticed an increase in the tick burden.

An external factor that influenced farmers' decisions with regards to spraying was the observed difference in the susceptibility of different cattle breeds to ECF. Farmers who had mixed breed cattle tended to spray their cattle more often than those with pure local breeds. This is an indication that farmers are aware of the fact that mixed breeds are more susceptible to the disease. This finding is similar to the finding by Chenyambuga et al. (2010) who found that farmers' who believed their cattle to be resistant to ECF tended to spray less than those who thought their cattle were susceptible to the disease.

Distance to the dip tank was also found to be a factor that influenced farmers' decisions on what type of ECF strategy to adopt. Farmers close to the dip tank used the dip tank while those further away used spraying as way of controlling ECF.

Extension services were found to have a minor role in influencing farmers on dipping and spraying regimes. This was due to the way in which veterinary extension services are availed to the farmers. Veterinary services in the area are inadequate in terms of information sharing. Most farmers depended on radio and neighbours to get information on ECF. The private veterinary service was conspicuously missing from the area despite government policy to liberalise the veterinary service. This has led to farmers only having access to the government veterinary service which among other things has low staffing levels. Lack of policy direction on delivery of extension services has led to farmers only being attended to when there is an outbreak of disease. This therefore implies that farmers who cannot pay will have no access to any veterinary service and will not have access to information can assist them in making appropriate decisions.

Training of farmers in recognition of disease and proper methods of spraying are hardly done, and hence contribute to the lack of farmers' awareness on proper methods of using acaricide. Ekoja (2008) proposed that farmers need information in order for them to fully adopt a technology as they might be ignorant about its usage.

5.3 Implication on Household Food Availability, Accessibility and Sovereignty

The study revealed as earlier mentioned that cattle are mostly used for draught power. The implication of food security on farmers' inability to control ECF can be seen in twofold.

The first is that is that they lose their ability to produce their own food through loss of draught power. All farmers in the study were found to cultivate crops for their own consumption. All of them grew maize which is the staple food, and some grew cash crops for sale. This implies that their incomes are meant to buy other foods which they do not produce. Losing animals to ECF and being unable to produce food increases their vulnerability to food price fluctuations.

It also implies that they might abandon cultivating their own land in order to look for off farm employment in order to improve their purchasing power to access food. Poor people have also been known to cut back on consumption in order to cope with the shortage of food in the house hold.(Save the children, 2002) In these cases the ones most affected are children and women due to the intra household food distribution system (Save the children, 2002).

The second is that inability to control ECF causes loss of money that was invested in buying the animal. As indicated in the study, cattle are an asset base. Losing cattle makes them more vulnerable to inability to be free of fear of hunger.

CHAPTER 6.0 CONCLUSION AND RECOMMENDATIONS

6.1 Conclusion

The study was set out to assess the factors that influence farmers' decisions with regards to dipping and spraying. The conceptual model for decision making in animal health proposed by Chilonda and Van Huylbroek (2001) was used in the study as a conceptual frame work.

Combining qualitative and quantitative methods of collecting as well as analysing data proved to be useful in the study by providing each other with checks and balances. The interviews and the focus group meetings provided information that could not have been captured by the lone use of a questionnaire. On the other hand biases that could have resulted from mere interviews such as ranking were minimised by use of calculating means.

Based on the findings, it can be concluded that farmers' decisions with regards to dipping and spraying as a way of controlling ECF are influenced by both internal and external factors.

Internal factors such as inadequate knowledge and literacy levels influenced their decision on ECF control. Availability of labour, especially male labour played a role in influencing frequency of dipping or spraying. Competition for water use in the house hold also influenced farmers' to use less water than required in order to be able to use for other household needs. Household economic factors also played a role in influencing farmers' decisions on the use and frequency of the acaricide. Most farmers used less acaricide in order to economise.

The external factors were found to be distance to the dip tank, ECF policy, veterinary services, seasonality and the breed of the cattle owned.

Distance to the dip tank influenced farmer's decision on whether to dip or spray their cattle.

Those closer to the dip tank used the dip while those further off relied on knapsack spraying

Seasonality and breed of animals was also found to influence farmers' decisions in frequency of spraying. Farmers decisions on dipping and spraying frequency were influenced by availability of water as well as a noted increase in illness of deaths, some farmers noted an increase of tick numbers.

The breed of cattle owned also influenced farmers' decisions with regards to dipping and spraying. Those who owned mixed breeds believed their cattle were more susceptible to the disease and hence decided to spray more frequently than those who owned local breeds.

Government veterinary services were found to play a minor role in influencing farmer's decisions with regards to spraying and dipping. Farmers' decisions were mostly influenced by information they obtained from neighbours and the radio. The other institutional factor investigated in the study was the ECF policy this has led to farmers making their own decisions without much direction from DVS on the proper way of dipping and spraying.

As shown in the study cattle play an important role in food security it is therefore imperative to understand the factors that influence farmers' decisions in controlling of ECF. This will assist policy makers to come up with decisions that are more farmer friendly and feasible.

6.2 Recommendations

- The study found that most farmers especially in Mungu and Kabweza ND depended on neighbours and radio for information. The department of veterinary services should make use of the local radio station to disseminate information about ECF and how it can be controlled; this will assist farmers to make decisions based on the correct information. This method of information dissemination will also counter the problem of depending on one VA to disseminate information to over 800 farmers in his area.
- Considering that the department of veterinary services and the farmers have divergent views on the issue of how to control ECF, it is necessary before any policy change is introduced to consult with the farmers on what ECF strategies are practical within their areas. Conducting focus group meetings will go a long way in closing the gap between the farmers and DVS.
- Most women in the study were found to be ignorant about ECF, it is recommended that women are encouraged to participate in order to gain knowledge and hence influence their decisions on dipping and spraying.
- Dipping and spraying are an expensive way of controlling ECF. It is important in the long term for DVS to collaborate with research in order to come up with cheaper ways of controlling the disease, such as vaccination or use of endemic stability. Another would be to carry out research on the efficacy of *Mululwe* as an acaricide since little research has been done in ethno veterinary medicine in Zambia.

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APPENDIX1: Questionnaire

Assessing the Factors influencing farmers' Decisions in the Control of East Coast Fever in Kafue, Zambia

This survey questionnaire is being undertaken to find out what factors influence farmers decisions with regards to dipping and spraying

Instructions

1. Use a tick mark or a circle to select the appropriate answer.
2. Certain questions have multiple answers.
3. The answers of the questions will be kept discreet from others and your privacy will be best maintained.
4. Please answer the questions with utmost honesty

Age –

Sex –

1) What is your level of education? (tick where appropriate)

Never been to school	Primary Education	Secondary education	Tertiary education

2) How long have you been a farmer?

3) How many people do you have in your household?

4) What is the size of your land in acres

5) What type of crops do you cultivate? -----

6) What is the size of your herd of cattle?

7) What are your main reasons for keeping cattle? Rank them in terms of importance (1-5)

Wealth	Financial security	Food (milk or Meat)	For income generation	Animal draft power

8) What other livestock do you own? Please indicate the numbers

Goats	sheep	poultry	chickens	pigs

9) What is the biggest constraint you have in raising your cattle?

A. Livestock diseases	B. Theft	C. Inadequate veterinary services	D. Lack of water	E. Lack of grazing land	F. Expensive veterinary products

10) What cattle diseases have you experienced in the last year?

Rank them according to their importance (1-5)

Black leg	Denkete	Senkobo	FMD	others

11) How in your opinion is ECF is transmitted?

Tse tse flies	Contact with sick animals	Ticks	Other(specify)

12) What signs do you see that gives you the impression the animal is suffering from ECF (Denkete)?

13) What method do you use for control of ticks?

A. Dipping	B. spraying	C. Deadline	D. Tick grease	E. Do not use anything	F. others

If answer for Q13 is E, please go to Q16.

14) How often do you dip/or spray your cattle?

A. Once a week	B. Twice a week	C. Once a month	D. Once in 3 months	E. Once in 6 months

15) What is the disease situation among your cattle in comparison to the time that you were not dipping /spraying?

A. No cattle deaths due to ECF	Less cattle sick	B. No difference	More cattle sick	More cattle dying

16) Who is your source of information about ECF (Denkete)? Rank them according to importance (1 for most important source of information, 5 for least important).

A. Government vet	B. Private vet	C. Neighbours	D. Radio	E. Passed on from family	E. News paper

17) How do you rate the veterinary services in your area?

A. Very good	B. good	C. fair	D. poor	E. Very poor

18) How do you find the prices of dip chemicals?

A. Very expensive-unaffordable	B. expensive	C. fair	D. cheap	E. Very cheap

19) Which veterinary service provider do you use?

A. Government vet only	B. Private only	C. I do not use any veterinary service	D. both private and government	E. none

20) How many times have you been visited by a government veterinary assistant in the last 3 months?

More than 3times	once	twice	Three times	Not visited

21) What do you propose can be done to reduce the problem of ECF?

Appendix 2: Check list for key informant

1. What are the major diseases in Zambia?
2. Which diseases is the most important disease for small scale farmers?
3. What is the current government policy on ECF?
4. What is the government policy on veterinary services?
5. What can be done to reduce the prevalence of ECF?
6. What would you propose regarding to ECF being called a management disease

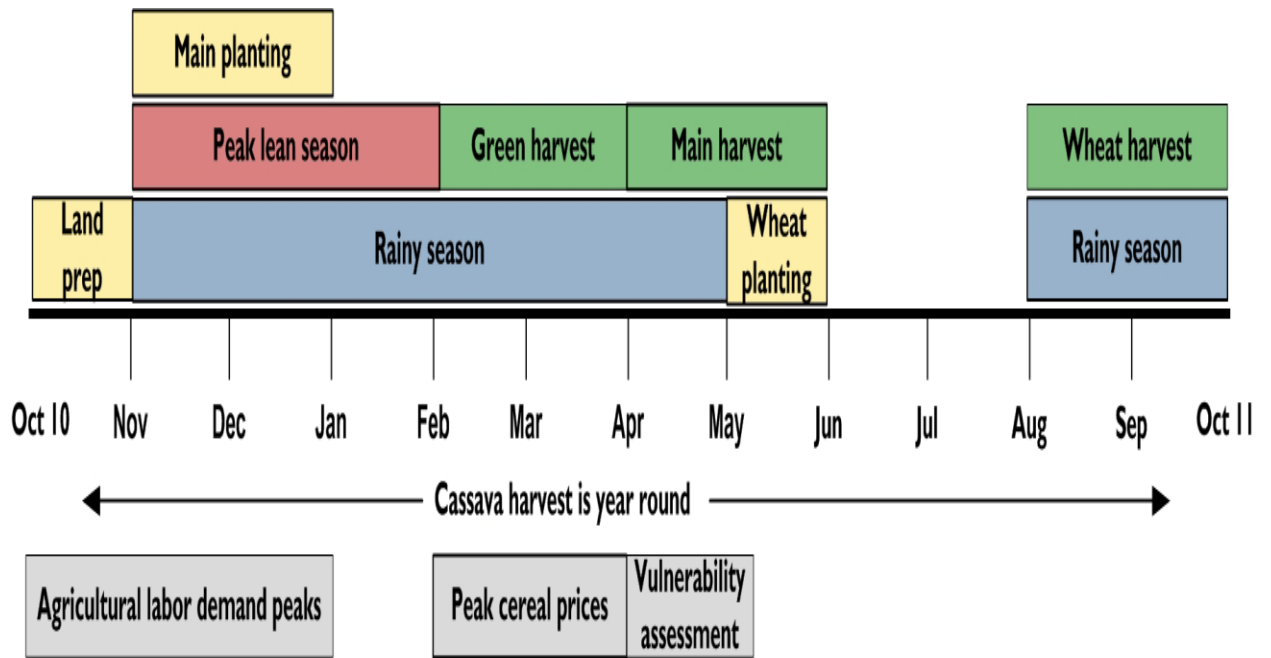
Appendix 3: Check list for VA

1. What exactly do you do in your job?
2. How many farmers are under your camp?
3. What are the major challenges in your job?
4. What do you think can be done to improve the veterinary service in your area?
5. What do you think is the main cause for inadequate dipping and spraying among farmers?
6. What is your perception of the farmers towards control of livestock diseases?

Appendix 4: Check list for case studies

- ✓ All questions in the questionnaire
- ✓ Main income sources
- ✓ Dipping regimes or spraying regimes-dilution of acaricide, number of animals sprayed per sprayer
- ✓ Main constraints in dipping
- ✓ Household labour-who does the dipping
- ✓ Main reasons for contacting the vet
- ✓ Priority expenses

Appendix 5: Seasonal Calendar



Source: FEWSNET