EFFECTS OF SELECTED DROUGHT MANAGEMENT STRATEGIES ON LIVESTOCK PRODUCTION IN ISIOLO COUNTY, KENYA

BY

ABDULAHI WARIO GUYO

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DECLARATION

This project report is my original work and has not been presented for award of degree in any other university.

Signature _____ Date _____

Name: Abdullahi Wario Guyo

L50/71922/2011

This project report has been submitted for examination with our approval as University supervisors

Signature _____ Date _____

Prof. Timothy Maitho

Department of Public Health, Pharmacology and Toxicology

University of Nairobi

Signature _____ Date _____

Chandi .J. Rugendo

Lecturer

Department of Extra Mural Studies

University of Nairobi

DEDICATION

I wish to dedicate my research project to my loving wife Nuria Nome Wario, my sons Hassan Abdullahi, Hussein Abdullahi and my daughter AminaLokoAbdullahi. My house girl Guye who was also very helpful to me.

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ABBREVIATIONS AND ACRONYMS

ACK	Anglican Church of Kenya
ALDEF	Arid Lands Development Focus
ALRMP	Arid Lands Resource Management Project
ASAL	Arid and Semi Arid Areas
DMI	Drought Management Initiative
DPIRP	Drought Prevention Recognition Programme
GoK	Government of Kenya
KMC	Kenya Meat Commission
NGOs	Non-Governmental Organizations
UN	United Nation
UNEP	United Nations Environmental Programme

ABSTRACT

Global warming and consequential climate changes are contemporary challenges in the world. Drought is a natural part of climate, although it may be erroneously considered as a race and random event. It occurs in virtually all climatic zones, but its characteristic varies significantly from one region to another. Over 80% of Kenya land mass fall under arid and semi arid land (ASAL), which are prone to frequent droughts. Livestock contributes heavily to Kenya's agriculture with respect to gross domestic product and food security of its population. It also provides, in part, the necessary thrust for other forms of development in the country ASALs mainly involving pastoralists' and agro-pastoralist who for the most part depend on livestock for the their living. The long term effects of droughts on pastoralists' are through decreased food security and lost bargaining power. Droughts are known to have short term and long term effects on pastoralists. The short term effects are the shocks caused by the heavy losses of animals due to a drastic and abrupt decline of grazing resources thereby exposing the pastoralists to severe transient food insecurity. Diverse livestock related interventions have been tried in Kenya. However it has not been effective in mitigating livestock loss since there is continued loss of livestock during drought. The purpose of this study was to assess effects of drought management strategies used to improve livestock production during drought in Isiolo County. Five research objectives will guide the study. The objectives sought to determine the Veterinary intervention measures used to improve production during drought in Isiolo County; assess the effectiveness of supplementary feeding on livestock production in Isiolo County; to assess the management strategies carried out by the government like training of farmers, extension services and disease control in Isiolo County; determine the effectiveness of water provision during drought in pastoral sector in Isiolo County and lastly establish how effective is destocking on livestock production in Isiolo County. The sample was 6 government line officials, 5 NGO officials 5 veterinary officials, 4 community leaders and 204 farmers. In total the sample size was 224. Descriptive study design will be adopted and data will be analyzed both qualitatively and quantitatively by use of statistical package for social sciences. It was concluded from the study that majority of the farmers practice destocking and that they did it timely and by so doing they realized value addition from the practice. It is also concluded that herders have been provided with veterinary services for the last five years such as community based para-veterinary services. The study further established that half of the pastoralist had reliable water while the other half had no reliable source of water. Finally, its concluded that there are supplementary livestock feeding thought the financial allocation was not adequate. The study is important to the Ministry of Livestock Development and other stakeholders in the livestock industry as it will provide information vital for the adoption of appropriate strategies to manage livestock during drought. The study recommended that approaches and intervention measures taken by the government be communicated effectively so as to benefit the community as well to save the county and country. Further the study recommended that government should commit itself in distribution of drugs so as to effectively mitigate drought

CHAPTER ONE

INTRODUCTION

1.1Background of the study

There are about 120 million pastoralists in the world, of which about 50 million pastoralists live in sub-Saharan Africa, many of them roaming the dry sub-Saharan belt that stretches from Mauritania to Ethiopia (Rass, 2006). Livestock production is a major source of employment in Kenya, and makes a significant contribution to the economy. Over the past decade, it has on average accounted for a quarter of the country's gross domestic product, and more than half of the income of small farmers. Overall, however, Kenya's livestock production does not meet domestic demand, and exports of livestock and livestock products are almost nonexistent. Over the last five years, livestock production has grown at a rate of 2.2%, compared with an average population growth slightly over 3%. Kenya is thus likely to become a net importer of meat and meat products in coming years.

In the arid and semi arid lands (ASALs), the livestock sector accounts for 90% of employment and more than 95% of household incomes. Most of the livestock slaughtered in major urban centres originates in these areas Republic of Kenya, 2003, with an annual slaughter of about 1.6 million Tropical Livestock Units (Omiti, 2003). Kenya's livestock from the arid and semi arid lands is said to be worth Kshs 60 billion (US$800 million). The internal livestock trade in the pastoral areas alone nets in about 6 billion shillings (US$80 million) a year. However, comparative international statistics show that livestock contributes 88% of the total agricultural output in Botswana even though the country has half Kenya's livestock population and is of less agricultural potential. Botswana does better per livestock unit than Kenya by producing US$70 million worth of meat exports annually (Salih, 2000). Thus, there is a huge potential contribution that livestock can make to the Kenyan national economy. The livestock sector should therefore receive adequate attention as happens in other countries (Orre, 2003).

Pastoralism has traditionally been oriented around camels and shoats, with shoats becoming predominant in recent times due to their greater marketability. The movement of water and feed resources to arid areas has been practiced since before ethnographers began to describe pastoral nomads (Blench, 2008). Today pastoralists throughout the North Africa and Southwest Asia have

relatively sophisticated trucking systems (of water, feed resources and the animals themselves) that allow them to exploit areas that in Sub- Saharan Africa would be unavailable (Blench, 2008). This is less true for pastoralists in the High Atlas and desert steppes in Morocco, where constraints are similar to those in Sub-Saharan Africa.

Drought is one of the most detrimental disasters distressing African pastoralists (Sear, 2005). Droughts are known to have short-term and long-term effects on pastoralists. The short-term effects are the shocks caused by the heavy losses of animals due to a drastic and abrupt decline of grazing resources, thereby exposing the pastoralists to severe transient food insecurity. Thus, pastoralists find themselves with excess animals in relation to land resources and with limited options for disposing of them, direct consumption or finding extra grazing and water (Swift,2002). The effect of the drought of 1999/2000 provides a good example of how obvious the lack of appropriate advice to pastoral communities led not only to the loss of property in animals but also to the rise in political tensions due to the movement in search of pasture into inappropriate private lands. The long-term effects of droughts on pastoralists are through decreased food security and lost bargaining power. In addition to loss of livestock, distress sales of livestock cause an abrupt decline in livestock prices, making it increasingly difficult for pastoralists to recover from such shocks, therefore rendering them more vulnerable to future disasters, and ultimately promoting poverty and hindering development (Republic of Kenya 2000). To avoid this, assistance must be given to find market outlets or any other means of disposing of the drought-induced extra livestock well before droughts strike. This can be achieved through close communication with the pastoralists (Upton, 2008).

Pastoralists adopt a number of strategies in order to cope with or manage droughts and other related hazards. These have relevance to emergency livestock off-take. These coping mechanisms can be grouped into two: established and recently adopted (Shapiro, 2009). Whilst the details of these may differ from community to community, the principles are generally the same. Among others, the broad categories of established strategies are movement of livestock to areas with better water and grazing resources, sale of livestock, prayer and payment to a rainmaker, resort to hunting and the use of wild foods, and the moral economy (Shapiro, 2009).

Responses to droughts by government and other stakeholders have differed from one drought to another. In the 1999–2000 droughts, for example, the Government of Kenya, mainly through the

ALRMP, was involved in a proactive rather than reactive manner in the response process. This was by making a deliberate effort in terms of contribution of resources and coordination to reduce the drought induced suffering of the pastoralists ((Salih, 2000).

Mitigation activities are aimed at preserving livelihoods, and typically planned for the early stages or onset of drought. However, mitigation activities are generally still practiced only on a pilot scale, and largely by NGOs, because of high transaction costs that the careful planning and in-depth knowledge of local conditions requires (Scoones, 2001). Drought is one of the most detrimental disasters distressing African pastoralists. The effect of the drought of 1999/2000 provides a good example of how obvious the lack of appropriate advice to pastoral communities led not only to the loss of property in animals but also to the rise in political tensions due to the movement in search of pasture into inappropriate private lands (Herr, 1992).

The Government of Kenya (GoK), aware of the need for effective response, focuses resources to reduce the negative impacts of droughts. Since 1996 the Office of the President, supported by the World Bank (WB), has been implementing the Arid Lands Resource Management Project (ALRMP1) with the objective of enhancing food security and reducing livelihood vulnerability in drought-prone and marginalized communities. The ALRMP, further supported by the European Union (EU) funded Drought Management Initiative (DMI), consolidated a national drought management system, with drought management structures at the national (KFSM2, KFSSG3), district (DSG's4) and community levels.

An assessment of the response to the 2008-2009 droughts in Isiolo District revealed that the MoLD/KMC off-take was considered problematic due to insufficient involvement by the district line ministries. Water trucking was cited as expensive and unsustainable although few alternatives could be offered (United Nations Environmental Programme [UNEP], 2002).Provision of hay and concentrates was not effective as it was too little too late with relatively little impact in relation to the perceived huge costs of transporting this very bulky item over large distances. Animal health interventions such as de-worming were considered highly effective with some 38,000 shoats treated by VSF. Security issues related to conflict between ethnic groups was noted as a very serious constraint to drought coping mechanisms.

1.2 Statement of the problem

According to Blench and Marriage (1999).Drought is the prime recurrent natural disaster in Kenya. It affects the 10 million mostly livestock owners people in the ASAL districts. Consequently, the National Drought Management System, a dedicated disaster risk management system addressing drought, was established almost twenty years ago. In the ASALs of Kenya, pastoral economy accounts for 90 percent of employment opportunities and 95 percent of family incomes and livelihood security (Huho, 2009; USAID, 2010). Drought kills millions of animals, and reduces millions of people to destitution and reliance on food relief. As already shown, livestock are an important resource of the arid areas, probably the most important, because pastoralists rely on them directly for their subsistence and income generation. Information on how the intervention strategies during drought can be tapped to avoid excessive losses and benefit the pastoralists is inadequate and unreliable (Ngumi, 2006).

Diverse livestock-related interventions have been tried in Kenya which include destocking and transport subsidies for emergency livestock purchase, veterinary interventions, supplementary feeding, water provision, and movement of livestock and people. These interventions have however not been effective in mitigating livestock loss Republic of Kenya. For example in Isiolo County, loss of animals has ranged between 25% of the total number of livestock. In 2008, the percentage of animals that died as a result of drought was 23%, 24% in 2009, 22.5% in 2010, 20% in 2011 and 23% in 2011 (District Livestock Office, Isiolo, 2012). This scenario shows that the relevance and the effectiveness of the mitigation measures remains a question since there is no significant reduction in the effect level of the drought on pastoral livelihoods. The current study will therefore assess the effects of drought intervention measures on livestock production in Isiolo County.

1.3 Purpose of the study

The purpose of this study was to assess effects of drought management strategies on livestock production in Isiolo County.

1.4 Objectives of the study

The study sought to achieve the following objectives:

1. To assess veterinary interventions measures used to improve livestock production during drought in Isiolo county
2. To assess the effects of supplementary feeding on livestock production inIsiolo county
3. To assess the impact of water supply on livestock production in Isiolo county.
4. To assess selected drought management strategies employed by the Government on livestock production in Isiolo county

1.5 Research questions

The study was guided by the following research questions

1. What is the veterinary intervention measures used to improve livestock production during drought in Isiolo County?
2. What are the effects of supplementary feeding on livestock production in Isiolo County?
3. How has the supply of water affected livestock production in Isiolo County?
4. How effective are the drought management strategies like training of farmers and drought management carried out by the government on livestock production in Isiolo County?

1.6 Significance of the study

The findings of this study will be important to the pastoral community because they will be made aware of the effective strategies which can be used to mitigate drought effects. The community was sensitized on awareness of drought hazards and the related mitigation strategies to which they were exposed and hence be able to take specific actions to minimize the threat of loss or damage. The central government which was direct responsibilities for citizens safety was sensitized on how it could provide effective drought risk reduction measures in order to advice, instruct, or engage the local population in a manner that increases their safety and reduces the possible loss of resources and livelihoods on which the community depends.

The county government might be sensitized in ensuring coordination among different line Ministries as well as with bilateral and multilateral partners through national platforms for drought effects mitigation strategies and approaches. The national government will be helped by the findings of this study to facilitate drought mitigation strategies, as well as the technical systems required for drought preparedness and building capacities of local community.

1.7 Limitations of the study

The limitation of this study was the use of ex-post facto research design which has its own inherent limitations it only investigates causation through analysis of past events; the investigator is not able to control attitudes of respondents which likely affect research findings. Mulusa (1990) noted that at times, respondents might give socially accepted answers to avoid offending the researcher. However, efforts were made in explaining to the respondents on the importance of the study and requesting the respondents to be sincere and honest. Another limitation was low literacy levels amongst the pastoral communities which made it hard for the respondents to understand the questions posed, however effort was made by the researcher to explain questions in the local language. Movement and migration by the pastoralist also hindered some of the target group's locations when required. The researcher however used the local elders to reach the respondents.

1.8 Delimitations of the study

The study was conducted on pastoral communities in Isiolo County which is arid and semi arid area. The findings were generalized to other arid and semi arid areas in the country.

1.9 Basic assumptions of the study

The study was based on the following assumptions. One of the assumptions was that the recurrent drought strategies used by the pastoralist are effective on livestock production in Isiolo County. The study also assumed that the respondents were honest in responding to the data collection instruments.

1.10 Definition of significant terms

Drought Refers to prolonged period without rain or water supply

Drought Management Refers intervention measures employed during times of drought.

Hay Refers to grass that is cut and dried for fodder.

Mitigation measure Refers to a procedure undertaken to reduce the adverse impacts that a project or activity may have on the environment.

Restocking Refers to an approach which aims at helping individual, pastoral or communities to build up lost herds in a sustainable manner.

Supplementary Feeding Refers to a programme in which feed is provided to selected animals to prevent starvation.

Shoats Refers to sheep and goats.

Livestock Refers to domesticated animals

1.11 Organization of the study

The study was organized in five chapters. The first chapter consists of the introduction, background of the study, statement of the problem, purpose of the study, objectives of the study, research questions, significance of the study, limitations of the study, delimitations of the study, basic assumptions of the study, definitions of significant terms and the organization of the study. Chapter two contains literature review and focused on the variables as indicated in the objectives of the study. Chapter three contains research methodology where the research design, target population, sample of the study, sampling procedures, research instruments data collection procedures, piloting of research instrument and data analysis techniques are given. Chapter Four is concerned with data analysis and discussion of the findings while chapter five will deal with summary of research findings, discussion, conclusions, and recommendations.

CHAPTER TWO

LITERATURE REVIEW

2.1 Introduction

The chapter focuses on livestock in Kenyan economy, livestock mitigation in arid areas, effect of destocking in drought mitigation, effect of veterinary interventions in drought mitigation, effect of supplementary feeding in drought mitigation, effect of water provision in drought mitigation and the effective is the movement of livestock in drought mitigation. The chapter also presents the theoretical and conceptual framework of the study.

2.2 Livestock in Kenyan economy

Livestock contributes heavily to Kenya's agriculture with respect to gross domestic product and food security of its population. It also provides, in part, the necessary thrust for other forms of development in the country. Most of the livestock are raised in the arid and semi-arid lands (ASALs), mainly involving pastoralists and agro-pastoralists that for the most part depend on livestock for their living. The statistics on livestock and their contribution differ according to the source of information. But recent government sources indicate that currently over 50% of the country's livestock population is based in the ASALs, which form about 80% of the country's land area Republic of Kenya.

Kenya's agricultural sector accounts for 20–30% of GDP. Of this, the livestock sector alone makes a contribution of about 50% Republic of Kenya. The livestock industry comprises mainly dairy, meat production, and hides and skins from cattle, sheep, goats and poultry Republic of Kenya. In the ASALs, the livestock sector accounts for 90% of employment and more than 95% of household incomes. Most of the livestock slaughtered in major urban centres originates in these areas Republic of Kenya, with an annual slaughter of about 1.6 million Tropical Livestock Units (Omiti, 2003). Kenya's livestock from the ASALs is said to be worth Kshs 60 billion (US$800 million). The internal livestock trade in the pastoral areas alone nets in about 6 billion shillings (US$80 million) a year. However, comparative international statistics show that livestock contributes 88% of the total agricultural output in Botswana even though the country has half Kenya's livestock population and is of less agricultural potential. Botswana does better

per livestock unit than Kenya by producing US$70 million worth of meat exports annually (Daily Nation, 29 March 2004; Omiti, 2003). Thus, there is a huge potential contribution that livestock can make to the Kenyan national economy. The livestock sector should therefore receive adequate attention as happens in other countries

Cullis (2002) asserts that subsistence pastoralism is more efficient when the maximum number of animals is maintained, even if the health of individual animals is compromised. Fluctuations in the number of animals have been termed a "dynamic equilibrium" between the nomad and the environment with substantial losses being part of the accepted cycle of events (Johnson 1969). The improvement of veterinary medicine and increase in its availability, along with extensive water development and the practice of restocking, however, have resulted in substantial growth in the animal population (Cullis, 2002). Potential drought interventions range for minimizing losses through health and feed interventions to reducing herd size through structured destocking or accelerating herd recovery through restocking. All of these interventions interfere in one way or another with the concept of a dynamic equilibrium. It is important therefore, that drought related interventions are part of a larger investment effort that strives to provide release valves that remove people and livestock from pastoral systems without loss of food security or livelihood (Cullis, 2002).

2.3 Mitigation measures used to improve Livestock production during drought.

Drought has been a frequent visitor to pastoral communities in recent years and there is some evidence that pastoral areas are both warmer and drier than in the past (Blench and Marriage, 2008), however, these climatic changes are relatively minor when compared to the scale of socio-economic change pastoral communities have experienced in recent times. Pastoralists have shown a remarkable capacity to evolve with their environment; however, the recent pace of change has left their evolutionary adaptability in its slipstream. This situation has been aggravated by their limited access to social services, particularly education, which has opened new windows of opportunity for too few pastoralists. With a limited range of income sources other than livestock, the natural tendency of both out of luck pastoralists and the supporting donor community is to seek solutions in a return to animal husbandry (Blench and Marriage, 2008). While new ecological theory provides some assurance that the rising human and livestock populations in pastoral areas will not destroy their environment, this is based on the assumption

that other checks and balances, notably disease, pestilence and war, will allow environmental reinvigoration from time to time. A large part of the political and development investment in pastoral areas, however, is designed to minimize the impact of these external shocks, while evolving socioeconomic conditions constrain pastoralist's traditional coping strategies (Barton, and Morton, (2001.

The arid districts are areas of low or undependable rainfall in which the average precipitation is deficient in relation to water requirements. They have harsh and complex environments, with fragile ecosystems quite susceptible to destruction under increased human population. Arid areas are found mainly in the northern, eastern and coastal parts of the country (Blench and Marriage, 2008). As already shown, livestock are an important resource of the arid areas, probably the most important, because pastoralists rely on them directly for their subsistence and income generation. Droughts are known to have short term and long-term effects on pastoralists. The short-term effects are the shocks caused by the heavy losses of animals due to a drastic and abrupt decline of grazing resources, thereby exposing the pastoralists to severe transient food insecurity (Cossin sand Upton, 2008).

The type of intervention will depend on many factors, some of the key ones being the availability of finances and other resources, the expected severity of drought, logistics and terrain. If the drought is expected to be severe, full-scale de-stocking operations may be recommended, including feeding the population with the de-stocked livestock as this was seen to be cost-effective and to have more positive socio-economic benefits than the traditional famine relief. However, like in full-scale famine relief operations, substantial amounts of financial resources would normally be required for this option (SandfordandHabtu, 2000).

If the drought is determined to be mild and/or localized in pockets in an area, veterinary intervention, water and feed supplementation may arrest the situation. But better still, stimulation of voluntary sale of livestock would be a least-cost approach in such a situation. Incentives such as provision of security to traders, transport subsidies, waiver of taxes and relaxation of night movements may strengthen this approach (SandfordandHabtu, 2000).

2.3.1 Effect of destocking in drought mitigation

The accumulation of animals is a proven livelihood strategy, when the primary feed resource (grazing land) is commonly owned and in the face of periodic disaster which threatens to reduce the herd. Income from livestock assets in pastoral Africa is primarily in the form of products produced from the livestock themselves, rather than in cash obtained from the sale of livestock. As such, economic theory suggests they are likely to be held until their income generating value falls below their salvage value, which is likely to be well past their market prime (Bailey, 1999). Pastoralist, nonetheless, regularly trade livestock and livestock product. Given the diversity of pastoral systems, it is impossible to characterize pastoralist livestock marketing strategies; however, it is a relative truism that in normal years, marketed livestock are overwhelmingly mature males. Pastoralist sales also typically show high seasonal and annual fluctuations (Sanford 2008).) And are often made to address specific cash requirements. The growing body of impoverished pastoralists, however, has fewer choices and may sell more immature stock (Coppock, 1992). Increased consumerism amongst young pastoralists is another factor leading to increased livestock sales and small ruminants trading appears to be expanding, in part because it incurs fewer social constraints and helps preserve cattle/camel wealth (Blench and Marriage, 2008).

Pastoral livestock markets are dynamic, as evidenced by the recent collapse of the Gulf market and growth in livestock trade from Ethiopia into Kenya. They are also generally, reasonably efficient (Sandford,2003), however, few are well enough developed to meet the cyclical nature of livestock sales from pastoral areas or, in some cases, the rising demand for grain in the pastoralist's diet. In times of drought, market terms of trade for pastoralists can deteriorate sharply, particularly where pastoralist's drought coping strategies are limited and infrastructure for grain supply and livestock off take is weak, however, this is not a universal response (Sandford, 2003).

Notwithstanding the pastoralist's desire to accumulate livestock rather than cash and the difficult access and high costs of livestock and livestock product marketing in rangelands, market development opportunities exist (Sandford, 2003). Better physical infrastructure in some market locations, improved road access and better information on more distant markets, will not only enhance the access of pastoralists to markets in which to sell their animals, but will also improve

their access to consumer goods and increase their integration into the larger market economy. The withdrawal of government regulatory agencies or marketing monopolies that add to the covert costs of trading, stifle competition and depress producer prices may be equally important (Behnke and Kerven, 2004). Pastoralist marketing strategies also change with access to other social and economic services. Reliable early warning systems, access to financial services, expanding fee-based education and health services and rising grain requirements variously reduce risk or expand cash requirements, changing marketing strategies and opportunities (Scoones, 2005).

The most important drought mitigation intervention tested so far is emergency livestock purchase. One form of this is where the implementing agency directly buys weak animals at above the market price (Aklilu and Wekesa, 2001). Animals are usually slaughtered and the meat distributed locally to schools, hospitals, orphanages or poor households. Alternatively, transport subsidies are offered to traders to encourage them to purchase stock thereby strengthening livestock markets. There have been two types of de-stocking namely commercial de-stocking which is an activity builds on existing marketing structures and is designed to improve access to markets. This can be done in a number of ways such as transport subsidy or through direct purchase of livestock at points where livestock is bought mainly for immediate transport and slaughter Kenya Meat Commission (KMC). In this case, the trader/producer has to deliver the livestock at the final collection point (Behnke and Kerven, 2004).

The second method, also used by KMC was that livestock is bought directly from producers in the affected districts and transported for slaughter at the risk of KMC .In the inventory, the only example of commercial de-stocking are the KMC interventions. Secondly there is the slaughter off-take (Aklilu andWekesa, 2001). This activity was first piloted in Kenya in Samburu District by OXFAM during the 1984 drought. For some time it was used as a ‘last-resort’ intervention whereby livestock, mainly shoats which are already in poor condition is bought by agencies and is then slaughtered and in most cases the resultant fresh meat is distributed to needy families. An earlier variant was that meat was dried and subsequently stored and distributed. This is seldom used now due to added complexities caused by logistics and need for suitable storage. A recent variant has been where slaughter/purchase points have been established and remain operational for a number of weeks (Oxfam, 2007).

Destocking has several purposes. It allows pastoral households to liquidate some of their capital assets (livestock) before they are lost and increases the purchasing power of these households. Some value is therefore salvaged from animals, which may otherwise have died and meat or stock can be redistributed to needy households (Behnke and Kerven, 2004). In theory protecting herders' purchasing power by buying animals where markets are absent creates two categories of beneficiary: those who sell animals to the intervention/project at subsidized prices, and those who benefit from the general rise in prices on local markets caused by the extra demand created by the intervention/project (Oxfam 2002).

Destocking can also create a market for weaker animals, thereby enabling herders to keep stronger animals in their herd, preserving a key household capital asset for post-drought recovery, impact on the nutritional status of poor households and contribute to school and other feeding programmes, support the trading activities of women's groups reduce overstocking around village settlements (Aklilu andWekesa, 2001).

A number of small agencies solicited funds for destocking in northern Kenya during the 1999-2001 droughts. For example the Anglican Church of Kenya (ACK) used donor funds to purchase over 6000 sheep and goats from local pastoral households in Marsabit District in exchange for cash and high protein energy feed. Purchased animals were slaughtered and the meat distributed to needy households. Some animals were retained for restocking and 30 animals were given to households who had lost all their animals during the drought. Pastoral household purchasing power was maintained allowing beneficiaries to purchase feed and drugs to maintain their remaining animals buy food for the household and pay school fees. There is some evidence that the purchase programme also stabilized livestock market prices (Oxfam 2002).

VSF-Belgium facilitated the purchase of 13,000 small stocks by women's and youth groups in Turkana District. The groups purchased the animals themselves and the agency bought the dried meat from them for distribution in schools and hospitals. Many of these animals would not have been slaughtered without the intervention of VSF. The purchasing power of livestock owners was improved, the groups slaughtering animals increased their incomes and the nutrition of hospital patients and school children improved (Aklilua ndWekesa, 2001)..

Arid Lands Development Focus(ALDEF) assisted poor women's groups with micro-credit to purchase more than 9,000 smallstock, 95 cattle and 194 camels in Wajir District. ALDEF purchased the meat from the groups for redistribution to needy households and organizations (Aklilu and Wekesa, 2001). Meat was made available to 17,000 beneficiaries (mostly urban poor) and 7000 pastoral households improved their purchasing power. The total cost of this intervention was $US193,000 and total benefits (cash transferred to pastoral households for animals purchased and the value of the meat distributed) were estimated to be $US260,000 (Morton and Sear, 2005).

As animal condition declines during drought, livestock traders become reluctant to risk purchasing animals for which there may be limited demand in terminal markets (e.g. Nairobi). A transport subsidy had been successfully used in Isiolo District during an earlier drought to assist pastoral households market stock and resulted in increased offtake as traders risks were reduced (Barton and Morton 2001). It also increased pastoral household purchasing power as many of the beneficiaries inhabited remote areas and would not have been able to market stock without this intervention (it was not possible to trek animals to market as water and pasture were scare on stock routes) (Barton and Morton 2001)..

Subsidies provided were for a total of 22,000 sheep and goats. It is not clear however, how many of these small stock would have been marketed without the subsidy. NORDA, an NGO based in Mandera District offered traders a subsidy to the value of one third the cost of transport (by truck) to Nairobi (Sahal, 2011). A similar operation in Turkana (VSF-Belgium) provided subsidies for both movement to terminal markets and movements within the district but was beset by fraudulent claims for subsidy (FAO., 2006). It is clear that the modus operandi for transport subsidies should be carefully planned to avoid fraud. A transport subsidy might however be more cost effective than a destocking/animal purchase programme in very remote locations. The end result from the pastoral household point of view is the same (i.e. improved purchasing power and salvaging of some capital) (Barton and Morton 2001). A subsidy should therefore be targeted at those locations not normally visited by traders. Under these conditions it is much easier to assess impact, where marketing normally takes place a subsidy may not be required as many of the animals purchased may have been bought and sold without the subsidy (Stockwatch, 2002a).

2.3.2 Effect of veterinary interventions in drought mitigation

Disaster related animal health interventions require a cost-effective, broad based animal health system for effective delivery. Past experience indicates that this cannot be achieved by government alone, although public veterinary services continue to have a pivotal role in setting policies for sustainable animal health services, co-coordinating training programs, monitoring disease epidemiology, planning intervention strategies and in monitoring their implementation and outcomes (Aklilu and Wekesa 2001). It is the private sector, however, in a variety of configurations that should ultimately delivery the clinical/preventative service to livestock owners. While a number of makeshift arrangements have supported CAHSs development and veterinary service delivery over the recent droughts in East Africa, they are unlikely to be sustainable under most existing veterinary policy/legislative environments. Substantial long term investment is required to protect livestock health in future disasters (Aklilu and Wekesa 2001).

During drought as animals weaken in the face of pasture and water shortages they become more susceptible to disease and parasitic loads. The objective of veterinary interventions is therefore to assist pastoral communities combat these diseases, particularly in their most valuable animals (breeding stock and loading camels)(Aklilu and Wekesa 2001). Improved survival of breeding stock will allow the rapid recovery of herds and livelihoods post drought. The main activities in veterinary interventions include vaccination, control of ecto/endo parasites, provision of drugs and associated trainings. For example COOPI/RAMATI and CIFA provided veterinary assistance in three Districts, Samburu, Marsabit and Moyale. Payment for drugs was in the form of goats, which were slaughtered and dried meat distributed to schools to strengthen the school-feeding programme during the drought treated (Aklilu and Wekesa 2001).

Between 5-6,000 households benefited from animal health provision on a monthly basis and over 40,000 small stock, 2,500 cattle, 3,700 camels and 72 donkeys were treated. Services were delivered by 100 community animal health workers (CAHWs) employed by the implementing agencies. Although the number of animals saved by this intervention is not known it was estimated that it may have contributed to the survival of 20% of the animals treated (Aklilu and Wekesa 2001). VSF-Belgium working with local communities in Turkana facilitated the treatment of 74,000 animals and the vaccination of 97,000 small stock against Contagious Caprine Pleuropneumonia (CCPP) on a cost recovery basis. The vaccination was designed to

assist the recovery of the livestock population post-drought as animals become very susceptible to CCPP when the rains return. It is not known how many animals were saved by this intervention.

The impact of drought can be reduced when a livestock vaccination/treatment plan is included in district drought preparedness strategies, combining all available resources including district veterinary staff, the private sector, NGOs, CAHWs and beneficiaries; when the first wave of epidemiologically linked treatments are contracted out to the private sector and applied by highly mobile teams, assisted by local CAHW, during the drought alert/preparedness phase before animals disperse; the second wave of treatments, also contracted out, focuses on the immediate period following drought breaking rains; when communities are actively involved in the development of treatment strategies, monitor disease situations and treatment impacts and report livestock movement plans under a participatory disease monitoring and evaluation programme; when drugs and vaccines are purchased through normal marketing channels wherever possible;when private veterinarians and CAHWs are paid their full service fee for disaster mitigation work; when a significant proportion of the cost of animal treatment is recovered from beneficiaries, with treatment vouchers provided to targeted poor households, redeemable at full cost by the health service provider; and when donor support is partially recycled through cost recovery measures and ultimately establishes a revolving fund that supports, through various sustainable means, the development of CAHSs(Aklilu and Wekesa 2001).

2.3.3 Effect of supplementary feeding in drought mitigation

Supplementary feeding had no place in traditional pastoralism, However, the availability of industrial by-products such as oil-seed cakes and molasses has begun to change this situation and wealthier owners of larger herds are gradually taking advantage of the flexibility they offer (Blench & Marriage, 1998). Activities include provision of hay, supplements and some pasture related interventions. Options for supplementary feeding of livestock during drought are discussed by Coppock, 1994, Sandfordand Habatu, 2001 and AkliluandWekesa2001 and include: the transportation of livestock to areas not affected by drought and having surplus fodder; the periodic set-aside of rangeland by communities as a drought reserve; the fencing of rangeland for calf enclosures; the collection of locally available feeds including hay and acacia pods; the production of fodder including various forms of legume banks and miscellaneous fodders

including, *inter alia*, *Opuntiaspp*(prickly pear) and *Atriplex spp.* (saltbush);the importation of hay, grain or green feed; molasses/urea supplements in liquid or block form. Mobility typifies arid zone pastoralism being the hub of opportunistic tacking systems. Restricting customary mobility usually reduces food security. It is particularly important to keep open transhumance routes and drought retreats that allow access to flood plains and areas of higher rainfall.

In some locations mobility involves collaboration with neighboring agricultural communities that include forage, manure, investment and employment linkages (Bayer and Bayer, 1995). Herder-farmer interactions, however, are increasingly stressed by the intensification of agriculture in upland areas and the conversion of rangeland to cropland, which does not improve food security if, through the loss of key resource areas, the whole of the regional pastoral system is thrown into disarray. Cattle-based systems, especially, can be decimated by the loss of just a few hundred hectares of floodplain (Pratt D.). Few pastoralists transport essential livestock to rented grazing in times of stress, as occurs with most ranching systems, but it is increasingly common for wealthy urbanites to purchase drought distressed stock at low prices and follow this strategy.

Most pastoralist systems have a tradition of communal pasture set aside as a drought reserve. Some also provide for household pasture reserves for feeding lactating and immature stock. While the household reserve system is expanding in some pastoral areas (Coppock 1994 pp 212), population pressure and the weakening of tribal reciprocity agreements and traditional law in many pastoral communities has eliminated pasture set aside practices. In theory, they will add value by buffering the onset of drought, providing for more orderly marketing strategies and the protection of key female stock. Set aside is also an important component of pasture rehabilitation, including the creation of fuel loads for fire-related bush control. In practice, fodder conservation does not often extend beyond family initiatives and is unlikely to return to pastoralist's communal resource management systems until governments improve pastoralist's land rights and donors strengthen capacity for participatory natural resource management in pastoral areas.

Coppock (1994) reports on the expansion of the calf enclosure (*kalo)* in the Boran pastoral system over the last 20-30 years, sometimes associated with the collection and feeding of selected grasses, which reflects the priority many pastoral systems place on calf mortality mitigation. He further notes the logic of intensifying calf management, which is largely under the

pastoralists control, through animal health, supplementary feeding and improved water access activities that would also improve women's labour efficiency. In periods of drought, strategic feeding of female calves would reduce mortality, extend dam lactation and accelerate post-drought recovery. Given the calves require fewer sources, many of which can be collected locally (see below), calf mortality reduction is a logical target for drought intervention.

Few pastoralists consistently engage in feed collection, although most collect "bush" food for human and livestock consumption in times of stress. Coppock (1994) reports on the nutritional merit of treeleaf and/or seed collection for feed, notably seed from *Acacia tortilis,* pods from *A. albida.* and leaffrom *A. brevispica and A. seyal,* but also notes the high annual variability in seed/pod production andthe labour cost of leaf collection, which dictate against their broad-based use (Blench and Marriage, 2008). With rising livestockpopulations and reduced mobility, however, it is likely that hay made from selected quality grasses, supplemented by protein rich acacia products and combined with better water supply will be increasingly adopted as a profitable strategy for reducing calf morbidity and mortality if effectively promoted amongst pastoralists. It also offers potential for increasing milk production by poorer families engaged in milk sale even fewer pastoralists grow fodder plants for animal feed or drought proofing and there is little positive evidence to date in Africa to support such action, with common property, labour and management constraints contributing to this outcome (Blench and Marriage, 2008).

Attempts to introduce herbaceous legumes into rangeland have been generally disappointing, the competition from native grasses being a major constraint. Most programs to establish other forages including *Opuntia*(spineless cactus*), Atriplex*(saltbush)*, Leucaena*and *Sesbania spp.* have been equally disappointing, although all of these species are used by pastoralists in environments where they occur naturally. The introduction of *Prosopis spp.*has generally been disastrous, where there is insufficient labour to control its spread. Despite these failures, continuing work on species introduction, particularly for dry season protein supply is justified as a breakthrough with just a single species could dramatically alter pastoral livestock productivity. That work should particularly focus on management practices as under grazing of potential legumes and overgrazing of exotic woody plants is likely to have contributed significantly to past failures.

Aklilu and Wekesa(2006) in their analysis of a drought related small ruminant grain supplementation programme in Kenya concluded that this intervention, built on pastoralists own

resources and capacities, reduced losses and had a positive effect on lactation in the recovery period. They further suggested the need for cost benefit analysis of supplementing livestock for sustained livelihoods as opposed to large-scale grain transfers for human consumption. Our own analysis also indicates good returns from feeding small quantities of supplemental hay or grain, with the latter showing better returns. Molasses/urea block supplementation is a well-established drought management strategy in ranching systems, but has enjoyed little sustainability in communally managed environments (Blench and Marriage, 2008). It is most applicable when used to encourage livestock to disperse more widely to exploit underutilized pasture, a situation that is not typical of pastoralist management systems. Where the need for urea/molasses block supplementation is needed, it is best provided by tendering through private manufacturers rather than through unsustainable NGO or community managed programmes (Oxfam, 2007).

The impact of supplementary feeding is similar to veterinary interventions, since it strengthens livestock so that they can live throughout the drought. Hay is bought and brought from other parts of the country for feeding the livestock. The feed is fortified with mineral and vitamin supplements if funds are available. However, this intervention is even more limited than veterinary intervention because there is a problem of cost, availability of large quantities of feed on a commercial scale, problems of storage of the feed and the logistics of transportation (Oxfam, 2007). The Anglican Church of Kenya (ACK) tried supplementary feeding in Marsabit during the drought of1999 to 2001 (RoK, 2006).If pastoral households lose valuable breeding stock during drought it can take many years for herd to recover. There is a danger that poorer households will not manage to rebuild their herds and as a consequence fall out of pastoral production. It is also important for pastoral households to maintain some stock to be able to take advantage of the, often good, grazing conditions which follow a drought. There is widespread anecdotal evidence that pastoralists sometimes use relief grain intended for human consumption to feed their herds.

Anglican Church of Kenya (ACK) of Marsabit has integrated supplementary feeding intervention with their de-stocking activities. Feed was exchanged for livestock which were slaughtered and the meat distributed to needy households ((Oxfam, 2007). 180 tones of high energy, fat and protein concentrate feeds was purchased which was sufficient to maintain 8,000

small stock for a period of 3 months. The total costs of the intervention were USD 48,000 and benefits were estimated to amount to USD128,000 (Oxfam, 2007).

This sort of linkage of supplementary feeding to destocking may help avoid one of the major drawbacks of supplementary livestock feeding when it is scaled-up: that it artificially maintains herd levels and thus exacerbates environmental degradation. This has been a controversial issue in Middle Eastern and North African countries (with middle or high per capita average incomes) where feed distribution during drought is practiced massively and increasingly delinked from objective meteorological drought (see for example Oram(1998) or Morton and Sear 2001). There is little likelihood of either donor or domestic funds being available in Kenya for intervention on this scale, but the environmental implications of maintaining herd numbers through drought, and selective procedures to mitigate them, must be borne in mind. A related set of interventions which has been discussed in Kenya is that of cow-calf camps and drought-time use of commercial ranches by pastoralists. These options are reviewed by Heath (2001).

2.3.4 Effect of water provision in drought mitigation

Access to water is essential for mobility and efficient tracking of feed resources. Better water access also improves human welfare, from both health and labour perspectives. If that water supply is designed to be ephemeral, it can contribute to the seasonal regulation of livestock distribution and density. Where water supply is permanent, settlement and local environmental damage usually ensue. Coppock (1994) notes the importance of water management as a determinant of social relations, citing examples where improved water access (pumping) advantaged wealth pastoralists, but was detrimental to poorer community members who traditionally provided the labour for water lifting.

Aklilu and Wekesa(2006) see the need to strengthen community based water supply management, particularly for the rehabilitation of existing water resources, which they perceive as more important than new water development. They also noted that water related interventions took the largest share of non-food related interventions (US$3.0 million) during the recent Kenyan drought. Sandford and Habatu, (2008) in reviewing the introduction of water tankering in the Somali region of Ethiopia, note its likely negative effects on private investment in water development and on social organisation. They also emphasize the need for the systematic

discussion and treatment of water issues and the development of district water plans. Only when there is an appreciation of regional ground water resources and of the distribution of people in relation to those resources, is it possible to formulate water development paths for pastoral areas that combine local and public good (Pratt, 1997).

Assistance with the provision of water for humans and livestock includes borehole maintenance as well as the drilling of emergency and contingency boreholes. An example is given by the drilling of the emergency borehole at Harakhotkhot in Wajir in 2000 by Oxfam. The emergency borehole enabled fifty families, previously using another borehole 70 km away, to water their animals locally. Estimated reduced mortality from the reduction in watering stress was valued at $US 64,300, compared to a construction cost of the borehole of $US 38,000. This does not take into account considerable additional benefits, including reduced animal mortality in later years, and reduction in women's time spent fetching domestic water (Oxfam, 2002).

Borehole repair and maintenance shows similar positive returns. Analysis of borehole maintenance in Wajir suggests that each unit of Ksh 1 million ($US 13,300) spent on maintenance or rapid repair of a particular borehole will be justified if it substantially reduces the risk that 125 cattle (estimated price Ksh 8,000 each), or 1,250 sheep or goats (estimated price Ksh 800 each), or some combination of these, will die following borehole failure (Oxfam, 2002). Given that in a drought the average borehole is serving several thousand cattle and several tens of thousands of sheep and goats, these are plausible assumptions. As before, this ignores further benefits to women in terms of reduced time spent collecting domestic water. Borehole repairs and maintenance may be considered a private good. If so, micro-finance products could be designed to allow pastoralists to contribute to the cost (Oxfam, 2002).

In addition to saving animal lives, secure water provision can reduce labour time spent watering animals and walking animals between water and pasture, as well as increasing the quality of pasture available. We were unable to find examples to quantify this (Oxfam, 2002). These are private goods. Emergency water interventions such as borehole maintenance and repair, contingency borehole drilling, and water tankering have a further important benefit in terms of women's time spent fetching domestic water. In conditions of water shortage, women spend many hours each day collecting water, with negative consequences for their own health, income earning opportunities, household survival and child care. Analysis of the water tankering around

Wajir town suggests that six months tankering to a particular site, at a cost of USD 7,700, resulted in savings in woman's time fetching water of USD 27,600, in addition to reduced animal mortality valued at USD 12,300 (Oxfam ,2002).

The true success of contingency boreholes may not be known for some years. Future management of these resources will be crucial before they can be claimed to be a success. In areas where drought-time grazing was opened up by the provision of water it will be essential that boreholes are closed (capped) during periods of average rainfall otherwise environmental degradation is likely to occur, such as that around boreholes elsewhere in northern Kenya (Oxfam, 2002). There is a danger that these areas of drought time grazing can become an open access resource if water is available year-round. To date it appears that communities have agreed to close contingency boreholes and to reserve use for future emergencies (Meigh, Robins and Calow 1999). Whether this commitment will be sustainable in the longer term is unclear. Free generator sets and borehole equipment were donated to community groups in several arid districts. This is an example of donor activity distorting local markets for fuel and spares that could lead to further dependency of pastoral communities and is counter to the principle of cost recovery pursued by other interventions. It could be argued that good drought preparedness on the part of communities, donors and local governments would include functioning boreholes with spares and fuel in place ready for any emergency (Oxfam, 2002).

2.3.5 Effective is the movement of livestock in drought mitigation

Movement is critical to pastoral household survival during drought. Allowing some movement of people and livestock across international borders can yield important benefits for pastoral communities, particularly when drought does not affect a whole region. Mobility is an important indigenous coping strategy and should be integrated with other mitigation interventions. Cross-border and other peace initiatives are therefore an important contributor to the mitigation of drought impacts. OAU-IBAR had been working in border areas of NE Uganda, SE Sudan, SW Ethiopia, and NW Kenya as part of the PARC programme for a number of years and therefore had established contact with drought-affected communities in Kenya and those pastoral groups less affected by drought in Uganda and Ethiopia. The objective was to use animal health to facilitate peace and reconciliation meetings between different antagonistic pastoral communities (ethnic groups) in order to create an environment conducive to the development of the livestock

sector. The purpose of the meetings was to use animal health as an entry point to begin discussions about decreasing raiding and banditry among the Karamojong and Turkana tribal groups and to improve access to critical water and pasture resources (Niamir-Fuller, 2009).

The project facilitated meetings between elders of the respective groups by arranging transport, food and accommodation. The elders would be allowed to discuss the issues of livestock keeping under one roof for a period of two to three days without the interference of politicians or civil servants, who could have influenced the outcome. Accessibility to critical water and pasture resources for Kenyan pastoralists was facilitated by this project. It is estimated that nearly 100,000 cattle from Turkana were in Uganda at the height of the drought in Kenya (Thornton, 2006). The cost of the project was US$ 72,000 and it was conservatively estimated that this led to savings of US$ 93,000 in terms of livestock that may have otherwise died due to drought. This estimate takes no account of the value of likely future trade and movement in livestock or of the under-utilised natural resources used by moving livestock and people (Thornton, 2006).

2.4 Theoretical framework

The study employed disaster management theories. Disaster risk management (DRM) takes challenges for this interdisciplinary science which requires an appropriate combination of various approaches such as systems engineering, micro economics, sociology and behavioral science, as well as providing a holistic framework for the promotion of the science. In its methodological development efforts, DRM gives greater importance to proactive countermeasures such as mitigation policies, disaster insurance or fund, risk communication and social preparedness. Reactive strategies are, however, studied as important ways to recover from disaster damage.

In ideal risk management, a prioritization process is followed whereby the risks with the greatest loss and the greatest probability of occurring are handled first, and risks with lower probability of occurrence and lower loss are handled in descending order. In practice the process can be very difficult, and balancing between risks with a high probability of occurrence but lower loss versus a risk with high loss but lower probability of occurrence can often be mishandled.

Intangible risk management identifies a new type of risk - a risk that has a 100% probability of occurring but is ignored by the organization due to a lack of identification ability. For example,

when deficient knowledge is applied to a situation, a knowledge risk materializes. Relationship risk appears when ineffective collaboration occurs. Process-engagement risk may be an issue when ineffective operational procedures are applied. These risks directly reduce the productivity of knowledge workers, decrease cost effectiveness, profitability, service, quality, reputation, brand value, and earnings. Intangible risk management allows risk management to create immediate value from the identification and reduction of risks that reduce productivity.

2.5 Conceptual framework

Independent Variables

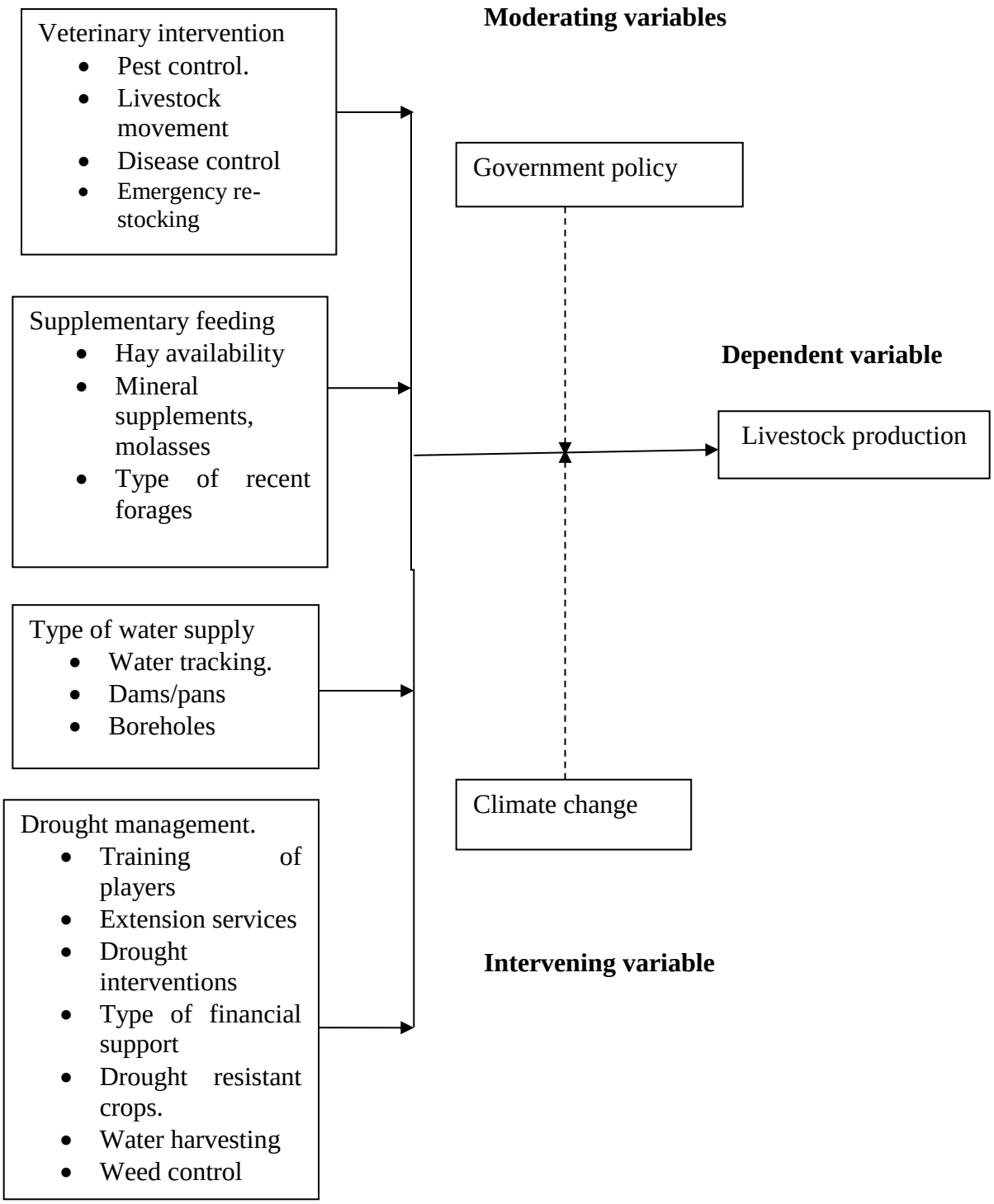

Figure 1: Conceptual Framework

2.6 Knowledge Gap:

Though some studies have been conducted in this area none has been conducted in Isiolo County on the effect of drought management strategies on livestock production, hence this study is intended to fill the knowledge gap.

CHAPTER THREE

RESEARCH METHODOLOGY

3.1 Introduction

This chapter deals with the procedures the researcher used in the study. The chapter covers research design, target population, sample and sampling procedures, research instruments, pilot study, validity and reliability of instruments, data collection procedures and data analysis procedures.

3.2 Research design

A descriptive survey design was used in the study. Descriptive survey design is used in preliminary and exploratory studies to allow researchers to gather information, summarize, present and interpret for the purpose of clarification.(Borg and Gall ,1989). The choice of the descriptive survey design is made based on the fact that in this study research is interested in the state of affairs already existing in the field and no variable will be manipulated. Survey design therefore is deemed appropriate because it enables the researcher to assess effects of drought intervention measures on livestock production during drought in livestock sector in Isiolo County.

3.3 Target population

Orodho (2004) Defines population as all the items or people under consideration. The researcher elected the stakeholders involved in drought intervention which included relevant Government of Kenya line departments 20, NGO officials 17, and Veterinary officials 17, County leaders 13 and 680 farmers.

3.4 Sample size and sampling procedures

Sampling as defined by Orodho (2004) is the process of selecting a subset of cases in order to draw conclusions about the entire set. Sampling is important because one can learn something about a large group by studying a few of its members thus saving time and money. The study employed cluster sampling. Stratified sampling is a sampling technique in which the entire population of interest is divided into subgroups otherwise called strata's from which random

sampling is done in each stratum. In this study the researcher selected strata's which include government officials from relevant departments including water, livestock, drought management, provincial administration among others, NGOs officials who worked in the county in last sequence of droughts veterinary officials and community chairpersons from different sampled districts in the county who are directly involved in mitigation of drought. The sample size is presented in Table3.1

Table 3.1 Sample size

Category	**Population size**	**percentage**	**Sample**
Government line officials	20	30	6
NGO officials	17	30	5
Veterinary officials	17	30	5
County Leaders	13	30	4
Farmers	680	30	204
Total	**747**	**30**	**224**

3.5 Research instruments

The researcher relied on self-administered questionnaires. A questionnaire is a research instrument that gathers data over a large sample (Kombo and Tromp, 2006). The advantages of using questionnaires are: the person administering the instrument has an opportunity to establish rapport, explain the purpose of the study and explain the meaning of items that may not be clear. Gay (1976) maintains that questionnaires give respondents freedom to express their views or opinions and also to make suggestions. They are also anonymous. Anonymity helps to produce more candid answers than it is possible in an interview.

3.6 Validity of the instruments

Validity is defined as the accuracy and meaningfulness of inferences, which are based on the research result (Mugenda and Mugenda, 1999) Validity according to Borg and Gall (1989) is the degree to which a test measures what it purports to measure. The internal validity which involved controlling the extraneous variables in the structure was done through the administration questionnaire. The researcher will seek assistance from the supervisor in order to improve content validity of the instruments.

3.7 Reliability of the instruments

Mugenda and Mugenda (1999) defines reliability as a measure of the degree to which a research instrument yields consistent results or data after repeated tests when administered a number of times. To enhance the reliability of the instrument.The aim of pre-testing was to gauge the clarity and relevance of the instrument items so that those items found to be inadequate for measuring variables will either discarded or modified to improve the quality of the research instruments.

This ensured that the instruments captured the required data. The procedure for getting an estimate of reliability was obtained from the administration of Test-Retest reliability method which involved administering the same instrument twice to the same group of subject with a time lapse between the first and second test. The following Pearson's product moment correlation coefficient formula was used.

$$r = \frac{N\Sigma xy - (\Sigma x)(\Sigma y)}{\sqrt{[N\Sigma(x)^2 - (\Sigma x^2)][N\Sigma(y)^2 - (\Sigma y)^2}}$$

According to Mugenda and Mugenda (1999) a coefficient of 0.80 or more will simply show that there is high reliability of data.

3.8 Data collection procedures

The researcher sought a research permit from the University of Nairobi and thereafter wrote letters to the respondents to be allowed to do the study. The selected samples were visited and the questionnaires administered to the respondents. The respondents were assured that strict

confidentiality would be maintained in dealing with their identities. The completed questionnaires were collected at the agreed time.

3.9 Data analysis

After the data had been collected there was cross-examination to ascertain their accuracy, competences and identify those items wrongly responded to, spelling mistakes and blank spaces.Quantitative data was then being entered into the computer for analysis using the Statistical Package for Social Sciences The frequencies and percentages was obtained. Tables were used to present the data while descriptive statistics such as percentages and frequencies were used to answer research questions. Qualitative data were analyzed according to the themes in the research objectives. The study also used to establish the relationship between the dependent and independent variables.

3.10 Ethical issues

The researcher assured the respondents on the confidentiality of information given by them. Respondents were informed of the purpose of the study and researcher also observed ethical issues relating to academic paper writing.

3.11 Operational definition of variables

Table 3.2Operational definition of variables

Objectives	Variable	Indicators	Measurement Scale	Type of Analysis
To assess the veterinary intervention measures used to improve livestock production in Isiolo county	**Independent** veterinary intervention measures	• Disease control • Livestock movement • Pests control • Type of diseases • Re-stocking	Interval Ratio	Descriptive
To assess the effect of supplementary feeding on livestock production in Isiolo county	supplementary feeding	• Type of Mineral supplements, molasses • Hay availability • Type of recent forages • Drought resistant crops	Ratio Ratio	Descriptive
To determine the effects of type of water supply to livestock in isiolo county	• Type of water supply	• Water tracking • Borehole • Dams	Interval Interval	Descriptive

To assess drought management strategies carried out by the government to improve livestock production in Isiolo County	• drought management strategies	• Training of farmers. • Extension services • Drought management • restocking • water harvesting • weed removal	Interval Interval	Descriptive
	Dependent • livestock production • milk production	• improved herd size of livestock • improved livestock meat and milk production	Ratio	Descriptive

CHAPTER FOUR

DATA ANALYSIS,PRESENTATION AND INTERPRETATION OF FINDINGS

4.1 Introduction

This chapter focuses on data analysis, presentation and interpretation. The purpose of the study was to investigate effects of drought management strategies on livestock production in Isiolo County, Kenya.

4.2 Response rate

Out of the 224 questionnaires that were distributed to the respondents 168questionnaires were filled and returned accounting for 75 percent response rate.

4.3 Demographic Characteristics of the Respondents

To understand the background of the respondents participating in the study, the researcher requested the respondents to indicate their gender, age and education level.

Table 4.1 shows distribution of respondents as per gender.

Table 4.1: Gender of the Respondents

	Frequency	**Percentage**
Male	88	52
Female	80	48
Total	**168**	**100**

Table 4.1.indicates that majority of the respondents were men as represented by 52% while the 48% of the respondents were women. This shows that men dominated pastoral activities in Isiolo County.

Table 4.2 shows age bracket of the respondents.

Table 4.2 Age of the Respondents

	Frequency	**Percentage**
Below 25 years	51	30
25 – 34 years	33	20
35 – 44 years	28	17
45 – 54 years	56	33
Total	**168**	**100**

Table 4.2 shows that 33% of the respondents were aged between 45-54 years, 30% of the respondents were aged below 25 years while 20% of the respondents were aged between 25 – 34 years. 17% of the respondents were aged between 35 – 44 years.

Table 4.3 shows educational level of the respondents.

Table 4.3 Education Level of the Respondents

	Frequency	**Percentage**
Certificate	113	67
Diploma	44	26
Degree	11	7
Total	**168**	**100.0**

Table 4.3 indicates that majority of the respondents were certificate holders as represented by 67% while 26 % of the respondents had diploma qualification. 7 % of the respondents were degree holders.

Table 4.4 shows the role of community leaders in drought mitigation.

Table 4.4 Role of community chairperson

Response	Frequency	Percentage
Yes	4	66.7
No	2	33.3
Total	**6**	**100.0**

From Table 4.4 majority of the respondents indicated that they were instrumental during drought as indicated by 66.7 percent of the respondents. 33% of the respondents indicated that they were not fully involved in drought mitigation measures.

Table 4.5 shows the duration the NGO officials have worked in the project.

Table 4.5 Duration of working in NGO institution

	Frequency	Percentage
1 – 5 years	3	60.0
6 – 10 years	2	40.0
Total	**5**	**100.0**

Table 4.5shows that majority of the NGO officials have worked with their institutions for a period of between 1-5 years while 40 % of the respondents indicated they had worked with the NGOs for a period of 6-10 years.

Table 4.6 shows the period that government and NGO officials have been working in their respective positions.

Table 4.6 Duration of working in the current position

	Frequency	Percentage
1 -5years	9	82
16 – 20 years	1	9
Over 20 years	1	9
Total	**11**	**100**

Table 4.6 illustrates that 82% of the respondents have been working in the same position for a period of 1-5 years while the rest 9% of the respondents have been working in the same position for a period between 16-20 years. 9% of the respondents have worked in the same position for over 20 years.

Table 4.7 shows the duration of NGOs involvement in drought mitigation programmes

Table 4.7 Involvement in Drought Mitigation Programmes

	Frequency	Percentage
1 -5years	4	66
6 – 10 years	1	17
11 – 15 years	1	17
Total	**6**	**100.0**

Table 4.7 shows that majority of the NGOs have been involved in mitigation measures for a period of 1-5 years as represented by 66 % of the respondents. 17 % of the respondents indicated that their organizations have been involved in drought mitigation measures for a period between 6-10 years and 11-15 years respectively.

4.4Effectiveness of drought mitigation measures in pastoral sector in Isiolo County

Table 4.8 shows the benefits of destocking

Table 4.8: Benefits of Destocking

	Frequency	**Percentage**
yes	104	66
no	53	34
Total	**157**	**100**

Table 4.8 shows that de stocking was beneficial for the survival of livestock during drought as represented by 66% of the respondents. 34 % of the respondents were of the view that de-stocking was not beneficial in improving livestock production.

Table 4.9 shows the role Played by NGO and Government officials in Drought Mitigation Programmes

Table 4.9: Role Played by NGO and Government officials in Drought Mitigation Programmes

	Frequency	Percentage
Destocking	1	11.1
Water supply	3	33.4
Veterinary interventions	1	11.1
Provision of livestock Supplementary feeding	4	44.4
Total	**9**	**100.0**

Table 4.9depicts that majority of the respondents were involved in provision of water to livestock and provision of supplementary feeding as indicated by 33.4 % and 44.4 % of the respondents respectively. 11.1 percent of the respondents were involved in de-stocking and veterinary intervention respectively.

Table 4.10 shows whether NGOs were involved in destocking

Table 4.10 Practicing of Destocking as Drought Mitigation measure

	Frequency	**Percentage**
yes	9	82
no	2	18
Total	**11**	**100**

Table 4.10 indicate that majority of the respondents indicated that their NGOs undertook de-stocking as one of the mitigation measure as represented by 82 %. 18 % of the respondents indicated that their NGOs were not involved in de stocking as one of the drought mitigation measure.

Table 4.11 shows the effectiveness of destocking as a mitigation measure.

Table 4.11: Effectiveness of Destocking as a drought mitigation measure

	Frequency	**Percentage**
Very effective	27	16
Effective	57	34
Ineffective	67	40
Very ineffective	2	1
Undecided	15	9
Total	**168**	**100**

Table 4.11 indicates that majority of the respondents perceived destocking as an effective measure for mitigating drought. This is exemplified by 34% of the respondents who viewed it as effective and 16% of the respondents who viewed it as very effective. Also 41% of the respondents perceived destocking to be in effective as a drought mitigation measure and 9% were un-decided.

Table 4.12 shows whether mitigation measures were carried out on time.

Table 4.12 Timeliness of Drought Mitigation measures

	Frequency	**Percentage**
Yes	57	34
No	111	66
Total	**168**	**100.0**

Table 4.12 indicates that majority of the respondents were of the view that the mitigation measures used to address drought were not timely as represented by 66% while 34 % of the respondents perceived the drought mitigation measures to be timely

Table 4.13 shows whether the community benefited from Government destocking initiatives.

Table 4.13 Benefit of Government Destocking

	Frequency	**Percentage**
yes	69	43.9
no	88	56.1
Total	**157**	**100.0**

Table 4.13 shows that majority of the respondents were of the view that government destocking programmes were not beneficial to the respondents as indicated by 56.1% while 43.9 % of the respondents indicated that they benefited from government destocking programmes.

Table 4.14 shows analysis of adequacy of the mitigation measures used during drought by use of the mean and standard deviation.

Table 4.14: Adequacy of Mitigation measures

	Mean	**Standard Deviation**
Destocking	4.42	0.325
Provision of water	4.83	0.753
Supplementary livestock feeding	4.67	0.516
Veterinary interventions	3.17	0.753

Table 4.14 shows that most of the respondents ranked the mitigation measures in the following order as per their satisfaction with provision. They ranked provision of water as adequate with a mean of 4.83, supplementary livestock feeding with a mean of 4.67,destocking with a mean of 4.42 and lastly veterinary interventions with a mean of 3.17.

Table 4.15 shows effectiveness of the mitigation measures

Table 4.15: Effectiveness of Mitigation Interventions

	Mean	**Standard Deviation**
Destocking	4.31	0.211
Provision of water	4.43	0.412
Supplementary livestock feeding	4.20	0.328
Veterinary interventions	3.69	0.307

Table 4.15 indicates that provision of water was the most effective mitigation measure with a mean of 4.43 followed by destocking with a mean score of 4.31; likewise, the study indicated

that supplementary livestock feeding was effective as indicated by mean score of 4.20 and lastly veterinary interventions was effective with a mean score of 3.69.

Table 4.16 shows the availability of livestock market during drought.

Table 4.16: Marketing of Livestock during drought

	Frequency	**Percentage**
Animals are bought at a loss	86	51.2
Animals are bought at a good price	40	23.8
The market depends on the prevailing conditions	42	25
Total	**168**	**100**

Table 4.16 indicates that majority of the respondents perceived that the animals were bought at a loss as indicated by 51.2 % of the respondents or at prevailing market conditions as indicated by 25% of the respondents. 23.8 % of the respondents indicated that the animals were bought at a good price during the drought period.

4.5 To assess the effectiveness of veterinary intervention during drought in pastoral sector in Isiolo County

Table 4.17 shows the availability of veterinary services

Table 4.17: Provision of Veterinary Services

	Frequency	**Percentage**
yes	66	42
no	91	58
Total	**157**	**100**

Table 4.17 shows that veterinary service in the past five years were not adequately available to farmers as indicated by 58 % of the respondents.42 % of the respondents indicated that veterinary services were available .

Table 4.18 shows whether services were rendered by Para-vets.

Table 4.18: Community Based Para-Veterinary Services

	Frequency	**Percentage**
Yes	114	70
No	49	30
Total	**163**	**100**

Table 4.18 indicates that 70% of the respondents were comfortable with the provision of community based Para-veterinary services in pastoral communities to mitigate drought. 30 % of the respondents indicated that community based Para-veterinary services were adequately provided.

Table 4.19 shows the source of drugs for livestock farmers.

Table 4.19: Source of Drug

	Frequency	**Percentage**
Purchase from agro-vet shops	93	59
Government	27	17
NGOs	38	24
Total	**158**	**100**

Table 4.19 shows that majority of the livestock farmers got their veterinary drugs from the available agro-vet shops as represented by 59 % of the respondents. 24% of the respondents got

their livestock drugs from NGOs while 17% of the respondents got their livestock drugs from the government.

The veterinary services provided to livestock farmers are shown in the table 4.20

Table 4.20: Veterinary Services Offered to livestock farmers

	Frequency	**Percentage**
Para-veterinary services	39	23.2
Provision of drugs	33	19.6
Treatment and vaccination of animals	96	57.2
Total	**158**	**100**

Table 4.20 indicates that 57.2% of the respondents were offered treatment and vaccination of animals by the government, community veterinary services and NGOs. 19.6% indicated that they are provided with drugs by government, community veterinary services and NGOs while 23.2% indicated that they are provided with Para-veterinary services.

Table 4.21 shows major players in provision of veterinary services

Table 4.21: Key Partners in the Provision of Veterinary Services.

	Frequency	**Percentage**
Government	15	10
Other NGOs	130	83
Religious organizations	12	8
Total	**157**	**100**

Table 4.21shows that the major player in provision of veterinary services among pastoralist in Isiolo County is the NGOs as represented by 83 percent of the respondents. The other major player is the government as indicated by 10% of the respondents and lastly the religious organizations as indicated by 8% of the respondents.

The effectiveness of veterinary services is shown in table 4.22.

Table 4.22: Effectiveness of Veterinary Services Offered

	Mean	**Standard deviation**
Para-veterinary services	3.20	1.643
Provision of drugs	3.48	1.317
Treatment and vaccination of animals	4.01	0.243

Table 4.22 indicates the effectiveness of veterinary services offered where most of the respondents indicated that treatment and vaccination of animals was effective as shown by mean score of 4.01, followed by the provision of drugs with a mean score of 3.48and finally the Para-veterinary services with a mean of 3.20.

Table 4.23 shows the major challenges facing provision of veterinary services.

Table 4.23: Challenges Facing Provision of Veterinary Services

	Frequency	**Percentage**
Unwillingness of the community to participate	48	29
Inadequate resources	57	34
Migration of animals during drought	63	37
	168	100

Table 4.23 indicates that the major challenge in provision of veterinary services was the migration of animals during drought as represented by 37% of the respondents followed by inadequate resources with 34% and lastly the unwillingness of the community to provide veterinary services to their animals as represented by 29% of the respondents.

4.6 To determine effectiveness of water provision during drought in Pastoral Sector in Isiolo County.

Table 4.24 shows the availability of local boreholes.

Table 4.24: Availability of Local Boreholes

	Frequency	Percentage
yes	64	42.4
no	87	57.6
Total	**151**	**100.0**

Table 4.24 indicates that 57.6 % of the respondents saw in- availability of boreholes as one of the obstacles in provision of water to their livestock. 42.4 % indicated that boreholes were available for provision of water to their animals. This implies that most of herders do not have access to water.

Table 4.25 shows the management of community water sources.

Table 4.25: Managing the Community Water Sources.

	Frequency	Percentage
Government	38	24
Private companies	26	17
Community self committees	93	59
Total	**157**	**100**

Table 4.25 shows that majority of the respondents (59%) indicated that community self committees were the managers of the community water sources, 24% pointed that government was the main manager of community rural water sources while 17% indicated that private companies were the managers of community rural water sources. This implies that despite drought being a calamity to the pastoralist community government has not taken full responsibility of managing the water sources.

Table 4.26 shows the effectiveness of water provision as a drought mitigation measure.

Table 4.26: Effectiveness of provision of water as a drought Mitigation measure

	Mean	Standard Deviation
Drilling emergency boreholes	4.21	0.341
Rehabilitation of old boreholes	2.20	1.643
Water trucking/Relief water	2.80	1.095
Fuel subsidy	3.40	0.548

Table 4.26 shows that drilling of emergency boreholes is effective as indicated by mean score of 4.21; further respondents indicated that Fuel subsidy is effective as shown by mean score of 3.40. Also respondents indicated that water trucking/Relief water was moderately effective as illustrated by mean score of 2.80 while respondent indicated that rehabilitation of old boreholes was ineffective as shown by a mean of 2.20.

Table 4.27 shows the challenges faced in provision of water to livestock farmers.

Table 4.27: Challenges in water Provision.

	Frequency	Percentage
Lack of fuel	48	27.3
Maintenance borehole breakdown	46	27.3
Overcrowding in the borehole	74	44
Total	**168**	**100**

Table 4.27 indicate that majority of the respondents reiterated that Overcrowding in the borehole is the main challenge faced in provision of water as represented by 44% of the respondents, 27.3% indicated that lack of fuel was the main challenge while 27.3% perceived that maintenance of borehole after breakdown was also a challenge in provision of water.

Table 4.28 shows the effectiveness of community water user association in managing water.

Table 4.28: Effectiveness of Community Water user Association in Managing Water

	Frequency	Percentage
very effective	38	23
effective	91	54
ineffective	34	20
undecided	5	3
Total	**168**	**100**

Table 4.28 shows that 54% of the respondents indicated that Community Water user Association was effective in managing water while 23% were of the opinion that Water user Association is very effective in managing water.

The agencies Involved in Water Provision to the Pastoralist are shown in table 4.29.

Table 4.29: Agencies Involved in Water Provision to the Pastoralist

	Frequency	Percentage
Other NGOs	3	60.0
Government	2	40.0
Total	**5**	**100.0**

Table 4.29 indicate 60% of the respondent indicated that NGOs were the main actors in provision of water to pastoralist and the government as indicated by 40% of the respondents.

4.6 To assess the effectiveness of supplementary feeding of livestock during drought pastoral areas in Isiolo County.

The availability of supplementary livestock feeds is shown in table 4.30

Table 4.30: Supplementary Livestock Feeding

	Frequency	Percent
Yes	84	50
No	84	50
Total	**168**	**100**

Table 4.30 shows that 50% of the respondents indicated that there are supplementary livestock feeding while the rest (50%) half of the respondent pointed that there is no programme involved in provision of supplementary feeding. This shows that disbursement of supplementary livestock feeding programme is not fully implemented thus leaving even more of the needy without adequate feed for their livestock.

Table 4.31 shows the effectiveness of supplementary feeding in drought mitigation

Table 4.31: Effectiveness of Supplementary Feeding in Drought Mitigation

	Frequency	Percentage
Very effective	38	23
Effective	91	54
Ineffective	34	20
Undecided	5	3
Total	**168**	**100**

Table 4.31shows that Majority (54%) of the respondents indicated that supplementary feeding in drought mitigation was effective, 23% pointed out that supplementary feeding in drought mitigation was very effective, 20% were of the opinion that supplementary feeding in drought mitigation was ineffective while 3% were undecided.

The source of supplementary feeding during drought is shown in table 4.32

Table 4.32: Provision of Supplementary Feeding

	Frequency	Percentage
GOK	68	40.4
NGOs	86	51.2
Community	14	8.4
Total	**168**	**100**

Table 4.32 indicates that majority (51.2%) of the respondents received supplementary feeding from NGOs, 40.4% indicated that they received supplementary feeding from GOK while 8.4% pointed that they received supplementary feeding from community.

Table 4.33 shows whether farmers were trained on supplementary feeding.

Table 4.33: Training

	Frequency	Percentage
preserving fodder for animals	57	34
alternative feeding of animals	92	55
controlled grazing	19	11
Total	**168**	**100**

Table 4.33 shows that 55% of the respondents indicated that they have received training on alternative feeding for their animals, 34% indicated that they had received training on preserving fodder for their animals while 11% pointedout that they have been trained on controlled grazing.

Table 4.34 shows the main activities carried out to support supplementary feeding.

Table 4.34: Effectiveness of Supplementary Feeding

	Mean	Standard deviation
Preserving fodder for animals	1.67	0.516
Alternative feeding of animals	2.37	0.421
Controlled grazing	1.50	0.548

Table 4.34 shows that alternative feeding of animals is adequate as depicted by mean score of 2.37, also respondents' indicated that Preserving fodder for animals was done adequately as shown by mean score of 1.67 while Control grazing was inadequate as shown by mean score of 1.50.

4.7 Regression analysis

In this study, a multiple regression analysis was conducted to test the influence among predictor variables. The research used statistical package for social sciences, SPSS V 17.0, to code, enter and compute the measurements of the multiple regressions.

Table 4.35: Results of multiple regressions between livestock production (dependent variable) and the combined effect of the selected predictors.

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	0.8890	0.7904	0.7605	0.5997

a. Predictors: (Constant), Veterinary intervention, Supplementary feeding, Drought Management, Type of water supply.

R-Square (coefficient of determination) is a commonly used statistic to evaluate model fit. R-square is 1 minus the ratio of residual variability. The $R^{2,}$ also called the coefficient of multiple determinations, is the percent of the variance in the dependent explained uniquely or jointly by the independent variables. 79.04% of the changes in the livestock production in Isiolo County variables could be attributed to the combined effects of the predictor variables.

Table 4.36: ANOVA results of the regression analysis between livestock production in Isiolo County and predictor variables

Model		Sum of Squares	Df	Mean Square	F	Sig.
1	Regression	42.04	4	10.51	26.40	3.8102E-09
	Residual	11.15	28	0.40		
	Total	53.19	32			

a. Predictors: Veterinary intervention, Supplementary feeding, Drought Management, Type of water supply.

b. Dependent Variable: Livestock production in Isiolo County.

The probability value of 3.8102 E-09 indicates that the regression relationship was highly significant in predicting how Veterinary intervention, Supplementary feeding, drought management, Type of water supply influenced livestock production in Isiolo County. The F calculated at 5% level of significance was 26.40 since F calculated is greater than the F critical (value = 2.2896), this shows that the overall model was significant.

Table 4.37: Regression coefficients

Model		Un-standardized Coefficients		Standardized Coefficients		
		B	**Std. Error**	**Beta**	**T**	**Sig.**
1	(Constant)	0.627	0.217		9.28	4.88E-10
	Veterinary intervention	0.791	0.149	0.613	2.719	1.11E-02
	Supplementary feeding	0.581	0.181	0.149	4.981	2.92E-05
	Type of water supply	0.834	0.296	0.234	3.01	5.48E-03
	Drought Management	0.363	0.191	0.138	1.778	8.63E-02

a. Dependent Variable: livestock production in Isiolo County

The regression equation above established that taking all factors into account (Veterinary intervention, Supplementary feeding, drought management, Type of water supply) constant at zero livestock production in Isiolo County will be 0.627. The findings presented also show that taking all other independent variables at zero, a unit increase in Veterinary intervention would lead to a 0.791 increase in the livestock production in Isiolo County. Further, the findings shows that a unit increases in Type of water supply would lead to a 0.834 increase in livestock production in Isiolo County. In addition, the findings show that a unit increase in Supplementary feeding would lead to a 0.581 increase in livestock production in Isiolo County. The study also

found that a unit increase in the scores of drought management would lead to a 0.363 increase in livestock production in Isiolo County. All the variables were significant at $P<0.05$. Overall, Type of water supply had the greatest effect on livestock production in Isiolo County followed by Veterinary intervention, then Supplementary feeding while drought management had the least effect.

CHAPTER FIVE

SUMMARY OF FINDINGS, DISCUSSION, CONCLUSIONS AND RECOMMENDATIONS.

5.1 Introduction

This chapter provides the summary of the findings, discussion, conclusions and recommendations of the study based on the objectives of the study. The chapter finally presents the suggestions for further studies.

5.2 Summary of the Findings

The first objective of this study was to assess veterinary interventions measures used to improve livestock production during drought in Isiolo county, to assess the effects of supplementary feeding on livestock production in Isiolo county, to assess the impact of water supply on livestock production in Isiolo county and to assess the drought management strategies employed by the government on livestock production in Isiolo county.

The study found that most (66%) farmers were benefiting from destocking. Majority 50% of the respondent played a key role of supply water to mitigate drought. Further the study found that Majority (82%) of the farmers practiced destocking and that they did it timely and that they realized value addition from the practice. However, destocking of animal as drought mitigation measure was ineffective although in some instances it was carried out on timely periods. Likewise, respondent indicated that they have not benefited from the government destocking. Provision of water was very adequate since most of community member were determined in supply of water. Also the study established that provision of water was effective while livestock are bought at a poor price during the drought season. However destocking as a drought mitigation strategy was effective.

The second objective of the study was to assess the effectiveness of veterinary intervention during drought in pastoral sector; the study established that herders have been provided with veterinary services for the last five years such as community based para-veterinary services.

Drugs were purchased from agro-vet shops while others sourced the same from source their drugs from NGOs. Further the study established that treatment and vaccination of animals were offered to the herders while government was providing drugs. On the same the study found that NGOs were the main partners in the provision of veterinary services to the pastoralists and these veterinary interventions were adequate and effective. However, the practice was marred by some challenges ranging from unwillingness of the community to participate, inadequate resources and migration of animals during drought. Community participation provision of veterinary services during drought was poor.

The third objective was to investigate the effectiveness of water provision during drought in pastoral sector; the study established that there was reliable water source for animal though almost half of the herders were not accessing water terming it as unreliable. On the same, the study established that there was no locally available boreholes while community self committees were the managers of the community water sources. Drilling emergency boreholes was effective as an approach taken in reducing water related risk during the drought and it was also marred by challenges during provision of water such as overcrowding in the borehole and lack of fuel. On effectiveness of community water user association in managing water, the study found that the body was effective and that drilling emergency boreholes was effective. Likewise the study established that NGOs and government were involved as the agencies.

The fourth objective was to assess the effectiveness of supplementary feeding of livestock during drought, the study established that there are supplementary livestock feeding thought the financial allocation were not adequate. The study also found that supplementary feeding in drought mitigation is effective while respondents received supplementary feeding from NGOs. Further the study revealed that majority of herders has received training on alternative feeding of animals and that the programme was adequate. Likewise the study established that no calf camp was established within pastoralist sector while the community chairpersons were responsible for key roles such as controlled grazing and preserving fodder for animals.

5.3 Discussion of the findings

The study set out to establish effectiveness of veterinary interventions measures used to improve livestock production during drought in Isiolo County, Kenya. From the study findings, the study

concludes thatmajority of the farmers were practice destocking and that they did it timely and by so doing they realized value addition from the practice. However, destocking of animal was ineffective though drought mitigation programme was carried timely. The study also concluded that provision of water was effective while livestock are bought at a poor price during the drought season.

The study also sought to access the effectiveness of veterinary intervention during drought in pastoral sector, the study concluded that herders have been provided with veterinary services for the last five years such as community based Para-veterinary services. Drugs were purchased from purchasing from agro-vet shops while others sourced the same from source their drugs from NGOs. Further the study concluded that treatment and vaccination of animals were offered to the herders while government was providing drugs. On the same the study found that NGOs were the main partners in the provision of veterinary services to the pastoralists and these veterinary interventions were adequate and effective.

The other objective of this study was to examine effectiveness of water provision during drought in pastoral sector; the study established that half of the pastoralist had reliable water while the other half had no reliable source of water. On the same the study concluded that no locally available boreholes while community self committees were the manager of the community water sources. Drilling emergency boreholes was effectiveness of approaches taken in reducing water related risk during the drought and it was also marred by challenges during provision of water such as overcrowding in the borehole and lack of fuel. On effectiveness of community water user association in managing water, the study found that the body was effective and that drilling emergency boreholes was effective.

Further the study aimed to access the effectiveness of supplementary feeding of livestock during drought, the study concluded that there are supplementary livestock feeding thought the financial allocation were not adequate. The study also concluded that supplementary feeding in draught mitigation is effective while respondents received supplementary feeding from NGOs. Further the study concluded that majority of herders has received training on alternative feeding of animals and that the programme was adequate.

5.4Conclusion of the study

The following were the conclusions of this study:

1. The study revealed that majority of the herders has received training on alternative feeding of animals.

2. The study revealed that most farmers benefited from destocking.

3. Herders were provided with veterinary services for the last five years.

4. Supplementary feeding in drought mitigation is effective

5.5 Recommendations of the study

The following were the recommendations of this study:

1. The study recommended that government should put in place veterinary interventions measures that will enhance drought mitigation to prevent loss of animals during drought within the Isiolo County.
2. Also the study recommends that enough veterinary officers should be posted in Isiolo County to ensure effective and prompt provision of veterinary services to pastoralists.
3. The study recommends that approaches and intervention measures taken by the government be communicated effectively so as to benefit the community as well to save the county and country. Further the study recommended that government should commit itself in distribution of drugs so as to effectively mitigate drought.
4. The study recommends that water should be availed to all pastoralists. Further, the study recommended that challenges facing management of water and other points of water should fully be resolved to ensure that there is effective supply of water to all without favoritism.

5. The study recommends funds should be allocated for effective supplementary feeding programmes. Accordingly, the study recommended that training on drought mitigation should be emphasized for the pastoralist to be enlightened on the consequences of improper treatment of the livestock and their benefit if properly treated.

5.6 Areas of Further study

The following are areas suggested for further research.

1. Further research should be done on the drought management strategies to other counties to provide the real situation all over the country.

2. Types of diseases that affect livestock production in Isiolo County.

3. Types mineral supplements that can be used by camels.

REFERENCES

Acheson, A. K and Gall M. D. (1987). *Technique in the clinical supervision of Teachers* New York: Longman.

Aklilu, Y and Wekesa, M. (2001).*Livestock and Livelihoods in Emergencies: Lessons Learnt from the 1999-2001 Emergency Response in the Pastoral Sector in Kenya.* OAU-IBAR, Nairobi, Kenya,

Aklilu, Y. and Wekesa, M., 2001. Livestock and livelihoods in emergencies: lessons learned from the 1999 – 2001 emergency response in the pstoral sector in Kenya. Feinstein International famine Centre, TuftsUniversity, Medford, MA, USA.

B. Heath (2001) The Feasibility of Establishing Cow-Calf Camps on Private Ranches as a Drought Mitigation Measure. Stockwatch, Nairobi

Bailey, D., Barrett C.B., Little P.D. and ChabariF.. 1999. *Livestock markets and risk management among East African pastoralists: a review and research agenda.* GL-CRSP Pastoral Risk Management Project Technical Report No. 03/99. UtahStateUniversity, Logan.

Bailey, D., Barrett C.B., Little P.D. and ChabariF.. 1999. *Livestock markets and risk management among East African pastoralists: a review and research agenda*. GL-CRSP Pastoral Risk Management Project Technical Report No. 03/99. UtahStateUniversity, Logan. 46 pp

Barton, D. and Morton, J. (2001). Livestock Marketing and Drought Mitigation in Northern Kenya. In J Morton (ed.) *Drought, Planning and Pastoralists: Experiences from Northern Kenya and Elsewhere,* NRI, Chatham.

Bayer, B. and Waters-Bayer, A. (1995).*Forage alternatives from range and field: pastoral forage management and improvement in the African drylands.* . Pp. 58-78 of Living with Uncertainty (ed.) Ian Scoones. London: Intermediate Technology Publications.

Behnke R and Kerven C. 2004.*Redesigning for risk: tracking and buffering environmental variability in Africa's rangelands*. Overseas Development Institute, Vol. 1, 1994.

Blench, ,R. and Marriage, Z. (1998). *Drought and livestock in semi-arid Africa and the Near East.Introductory essay with annotated bibliography.*Draft - Prepared for circulation at FAO electronic conference 'Drought and livestock in semi-arid Africa and the Near East'

Blench, R. and Marriage, Z. 1999. Drought and livestock in semi-arid Africa and South West Asia. ODI Working report 117.

Blench,R. and Marriage, Z. 2008. *Drought and livestock in semi-arid Africa and the Near East.Introductory essay with annotated bibliography.*Draft - Prepared for circulation at FAO electronic conference 'Drought and livestock in semi- arid Africa and the Near East'

Borg, R. W. and Gall, M. D. (1989).*Educational Research,* Longman Publishers,New York.

Coppock L. 1992. Culture, environment, technology: development interventions in pastoral Ethiopia. *A National Geographic Research and Exploration 8(3) 296- 307.*

Coppock, D L (1994) *TheBorana Plateau of Southern Ethiopia: Synthesis of Pastoral Research, Development and Change*. ILCA Systems Study 5, Addis Ababa

Cossins N J. and Upton M. (2008).The impact of climate variation on the Boran pastoral system.*Agriculture Systems 27*: 251-278.

Cullis,P.(2002). "Emergency relief programmes for pastoral communities", Development in Practice, 3:2, pp.92-102.

Evers, Y.D. (1994). Dealing with risk and uncertainty in Africa's drylands: the social dimensions of desertification. IIED Dryland Network Programme. Paper No. 48. London: International Institute of Environment and Development.

FAO. 2006. *Drought related livestock interventions.* FAO report, Rome.pp. 47.

Gay, L. (1992). *Educational Research: Competence for Analysis and Application*4th Edition. Macmillan Publisher,New York.

Huho JM, Ngaira JKW and Ogindo, H.O. (2009). Climate change and pastoral economy in Kenya: a blinking future. ActaGeologicaSinica (English Edition). 83(5):1017-1023.

Maxwell, D. and Watkins, B. *Humanitarian Information Systems and Emergencies: Understanding Early Warning in a Logical Context.* Workshop on Pastoral Early Warning and Early Response, Mombasa, Kenya, 13-15 November 2001.

Maxwell. D., (2001).“Youth Livelihoods and Enterprise Activities in Malawi”.Report to IDRC, Canada.

Meigh, J. N. Robins and R. Calow (1999).Water Resources Aspects of Drought DFID Water Resources Occasional Paper.

Morton, J.andSear, C. (2005) "Challenges for Drought Management in West Asia and North Africa" Paper presented to Ministerial Meeting on Opportunities for Sustainable Investment in the Rainfed Areas of West Asia and North Africa, Rabat, Morocco and forthcoming as chapter of book published by IFAD.

Mugenda, O. M. and Mugenda A. G. M. (1999).*Research Methods.Quantitative and Qualitative Approaches, Nairobi.African Centre for Technology Studies.*

Mulusa, T. (1990).*Evaluation Research for Beginners: A practical Study Guide*. Nairobi: Nairobi University Press,Nairobi.

Niamir-Fuller, M., Ed. 2009.*Managing Mobility in African Rangelands*.London, Intermediate Technology Publications.

Oram, P. (1998) "The Influence of Government Policies on Livestock Production and the Environment in West Asia and North Africa (WANA) in A.J.Nel (ed.) Livestock and the Environment: International Conference,IAC, Wageningen

Oram, P. (1998). "The Influence of Government Policies on Livestock Production and the Environment in West Asia and North Africa (WANA) in A.J.Nel (ed.) *Livestock and the Environment: International Conference,*IAC, Wageningen.

Orodho, J. A. (2004). *Techniques of Writing Research Proposals and Report*Reata Printers, Nairobi.

Oxfam (2002) Evaluation Report of the Drought Mitigation Programme in Wajir, Moyale, Isiolo and Turkana Districts of Kenya, October 1999-March 2001,Acacia Consultants,Nairobi:.

Oxfam (2007).*Evaluation Report of the Drought Mitigation Programme in Wajir, Moyale, Isiolo and Turkana Districts of Kenya, October 1999-March 2001*.Nairobi: Acacia Consultants.

Pratt D. J. *Food security in arid rangelands: An assessment of issues and approaches.* UN Conference of the Parties to the Convention on Desertification, Rome, 29 September-10

Republic of Kenya (2000).*A hand book for school inspection*. Nairobi: Government Printers.

Republic of Kenya (2001).*Ministry of Education Science and Technology Handbook for Inspection of Educational Institutions.*Government PrinterNairobi.

Republic of Kenya (2007). Ministry of Education Strategic Plan 2006 – 2011.

Republic of Kenya, (2003): *Directorate of Human Resource Circular*: MOEST.Sahal 2011

Sandford S. and Habtu Y. (2000) *Emergency response interventions in pastoral areas of Ethiopia.*A report commissioned by the UK Department for International Development.

Scoones (2001) "Drought Planning and Livestock in Southern Zimbabwe" in Morton, J. (ed.) *Pastoralism, Drought and Planning: Lessons from Northern Kenya and Elsewhere,* NRI.

Scoones, I. (2005). *New directions in pastoral development in Africa.*Pp. 1-36 of Living with Uncertainty (ed.) Ian Scoones. London: Intermediate Technology Publications.

Stockwatch (2002a) Livestock-Related Drought Mitigation Projects in Kenya: Participatory evaluation of social and economic impacts of interventions at the household level: Samburu District. Stockwatch, Nairobi.

Swift, J., D. Barton and J. Morton (2002). 'Drought management for pastoral livelihoods: policy guidelines for Kenya'. Pastoralism: NRI (Natural Resources Institute) Research, Advisory and Consultancy Projects.

Thornton, P.K., Jones, P.G., Owiyo, T.M., Kruska, R.L.,Herrero, M., Kristjanson, P., Notenbaert, A., Bekele, N. and Omolo, A. 2006. *Mapping climate vulnerability and poverty in Africa.*International Livestock Research Institute, Nairobi, Kenya.

Turner, M.D. 2000. Drought,domestic budgeting, and changing wealth distribution within Sahelian households. *Development and Change* 31:1009-1035.

UNEP. 2002. *Global environment outlook 3: Past, present and future perspectives.* United Nations Environment Programme, Nairobi, Kenya.pp. 416.

USAID (2010).Drylands livestock development programme. Available at:http://kenya.usaid.gov/programs/economic-growth/412

APPENDICES

APPENDIX 1: LETTER OF INTRODUCTION

AbdullahiWarioGuyo

University of Nairobi

Department of Extra Mural Studies

P.O.Box 30197

Nairobi.

Dear Respondent

RE:Effects of drought management strategies on livestock production in Isiolo County, Kenya

I am a post graduate student pursuing Master of Artsdegree in Project Planning and Management of University of Nairobi. I am currently writing a research project on drought intervention measures on livestock production in Isiolo County, Kenya. The attached questionnaire seeks to gather information as pertains to the study. You are assured that the information you will provide in the questionnaire is for academic purpose and that your identity will be treated with confidentiality. I will be grateful for your cooperation and active participation to this academic effort.

Yours faithfully,

Mr. AbdulahiWarioGuyo

L50/71922/2011

APPENDIX 2:QUESTIONNAIRE FOR GOVERNMENT LINE OFFICERS

Instructions

Kindly respond to all items by putting a tick in appropriate bracket or filling in the spaces provided

Section A: Demographic information

1. What is the name of your department _____?
2. What is your gender?

Male [ ] Female [ ]

3. What is your age?

Below 25 years [ ] 25 – 34 years [ ]

35 – 44 years [ ] 45 – 54 years [ ]

Over 54 years [ ]

4. What is your position in your department_____?
5. What is your highest level of education?

Certification [ ]

Diploma [ ]

Degree [ ]

Others [ ]

6. How long have you worked in this department?

Below 1 year [ ] 1 -5years [ ]

6 – 10 years [ ] 11 – 15 years [ ]

16 – 20 years [ ] Over 20 years [ ]

7. How long have you been involved in drought mitigation programmes?

Below 1 year [ ] 1 -5years [ ]

6 – 10 years [ ] 11 – 15 years [ ]

16 – 20 years [ ] Over 20 years [ ]

Section B: To determine the effectiveness of destocking during drought in pastoral sector in Isiolo county

8. What areas do you play in drought mitigation programmes?

Destocking [ ]

Veterinary intervention [ ]

Water supply [ ]

Provision of livestock Supplementary feeding [ ]

Any other (Please specify) _____

9. In your opinion is the drought mitigationprogramme timely

Yes [ ] No [ ]

10. How adequate are the following mitigation approaches?

Intervention	**Very adequate**	**Adequate**	**Not adequate**	**Undecided**
Destocking				
Provision of water				
Supplementary livestock feeding				
Veterinary interventions				

11. How effective are the following mitigation interventions?

Intervention	**Very Effective**	**Effective**	**Not effective**	**Undecided**
Destocking				
Provision of water				
Supplementary livestock feeding				
Veterinary interventions				

12. Is destocking one of the areas of drought mitigation strategies?

Yes [ ] No [ ]

13. If yes, how effective is it in mitigation livestock salvaging?

Very effective [ ] Effective [ ]

Ineffective [ ] Very ineffective [ ]

Undecided [ ]

14. How is the market for these animals?

Animals are bought at a loss [ ]

Animals are bought at a good price [ ]

The market depends on the prevailing conditions [ ]

15. In your opinion do the herders get value of their animals during destocking?

Yes [ ] No [ ]

16. Which organizations are involved in destocking interventions?

_____

17. In what ways can destocking as a drought mitigation strategy be improved

_____

_____

_____

Section C: To assess the effectiveness of veterinary interventions during drought in pastoral sector in Isiolo county

18. Do you have the following veterinary interventions during drought?

Para veterinary services [ ]

Provision of drugs to animals [ ]

Examination and vaccination of animals [ ]

Any other (Please specify) _____

19. Are there community based para-veterinary services in pastoral communities to mitigate drought?

Yes [ ] No [ ]

20. How would you rate the veterinary intervention strategies in drought mitigation?

Very effective [ ] Effective [ ]

Ineffective [ ] Very ineffective [ ]

Undecided [ ]

21. Rate the governments' provision of veterinary interventions?

Very timely [ ]

Not timely [ ]

Sometimes timely [ ]

22. What are some of the challenges faced in the provision of veterinary services?

_____

23. Who are the key players in the provision of veterinary services?

_____

24. In what ways can veterinary services during draught be improved?

_____

_____

_____

Section D: To determined the effectiveness of water provision during drought in pastoral sector in Isiolo County

25. What have stakeholders in drought mitigation done to ensure availability of water?

Drilling boreholes [ ]

Excavating dams [ ]

Water trucking [ ]

Any other (Please specify) …….

26. How effective is the management of rural pastoral water sources by the community?

Very effective [ ] Effective [ ]

Ineffective [ ] Very ineffective [ ]

Undecided [ ]

27. If not effective suggest ways you can improve the management of the rural water sources?

_____

_____

_____

28. Do you have the following activities of ensuring provision of water?

Drilling emergency boreholes [ ]

Rehabilitating existing water sources [ ]

Water trucking [ ]

Others specify _____

29. Give two ways in which you can handle provision of water during drought?

_____

_____

_____

Section E: To assess the effectiveness of supplementary feeding of livestock during drought in pastoral sector in Isiolo county

30. Is theresupplementary feeding during drought?

Yes [ ] No [ ]

31. Is there adequate financial resources for supplementary feeding during drought?

Yes [ ] No [ ]

32. How do you rate the effectiveness of livestock supplementary feeding in drought mitigation?

Very effective [ ] Effective [ ]

Ineffective [ ] Very Ineffective [ ]

Undecided [ ]

33. Are there calf camp to ensure supplementary feeding?

Yes [ ] No [ ]

34. What is the role of the community in supplementary feeding?

Preserving fodder for animals [ ]

Alternative feeding of animals [ ]

Control grazing [ ]

APPENDIX 3: QUESTIONNAIRE FOR NGO OFFICERS

Instructions

Kindly tick on the relevant box and fill blank spaces.

Section A: Demographic information of the respondents

1. What is the name of your organization _____
2. Please indicate your gender

Male [ ]

Female [ ]

3. What is your age bracket?

a. Below 25 years [ ]

b. 25 – 34 years [ ]

c. 35 – 44 years [ ]

d. 45 – 54 years [ ]

e. Over 54 years [ ]

4. How long have you been in this organization?

Below 1 year [ ] 1 – 5 years [ ]

6 – 10 years [ ] 11 – 15 years [ ]

16 – 20 years [ ] Over 20 years [ ]

5. How long have you worked in the current position?

Below 1 year [ ] 1 – 5 years [ ]

6 – 10 years [ ] 11 – 15 years [ ]

16 – 20 years [ ] Over 20 years [ ]

Section B: To determine the effectiveness of destocking during drought in pastoral sector in Isiolo county

6. Does your organization carry out destocking during drought?

Yes [ ] No [ ]

7. If yes, how effective is it in mitigation livestock salvaging?

Very effective [ ] Effective [ ]

Ineffective [ ] Very Ineffective [ ]

Undecided [ ]

8. Is destocking as a mitigation strategy carried at the right time of the drought cycle?

Yes [ ] No [ ]

9. How do you rate the effectiveness of the following destocking approaches?

Intervention	Very Effective	Effective	Not effective	Undecided
Direct livestock purchase				
Transport subsidy for livestock traders				
Micro financing livestock traders				

10. How do you rate the market for the animals destocked during drought?

Very Good [ ] Good [ ]

Poor [ ] Very poor [ ]

Undecided [ ]

11. Which organizations are involved in the destocking activity?

_____

12. How would you rate the whole process of destocking as a drought mitigation strategy?

Very effective [ ] Effective [ ]

Ineffective [ ] Very Ineffective [ ]

Undecided [ ]

Section C: To assess the effectiveness of veterinary interventions during drought in pastoral sector in Isiolo county

13. What veterinary services are carried out by your organization?

Para-veterinary services [ ]

Provision of drugs [ ]

Treatment and vaccination of animals [ ]

14. How effective are the veterinary services offered?

Very effective [ ] Effective [ ]

Ineffective [ ] Very Ineffective [ ]

Undecided [ ]

Para-veterinary services

Very effective [ ]

Effective [ ]

Ineffective [ ]

Very Ineffective [ ]

Undecided [ ]

Provision of drugs

Very effective [ ]

Effective [ ]

Ineffective [ ]

Very Ineffective [ ]

Undecided [ ]

Treatment and vaccination of animals

Very effective [ ]

Effective [ ]

Ineffective [ ]

Very Ineffective [ ]

Undecided [ ]

15. What challenges are faced in the provision of veterinary services?

Unwillingness of the community to participate [ ]

Inadequate resources [ ]

Migration of animals during drought [ ]

Any others (please specify) _____\

16. How do you rate community participation in provision of veterinary services during droughts?

Very good[ ] Good [ ]

Poor [ ] Very Poor [ ]

Undecided [ ]

17. What suggestions can be put in place to ensure effective veterinary intervention during draught_____
_____

Section D: To determined the effectiveness of water provision during drought in pastoral sector in IsioloCounty

18. What has your organization done to cater for water provision for pastoralists?

Sinking boreholes [ ]

Water trucking [ ]

Rehabilitation of water sources [ ]

Any others (please specify) _____

19. Rate the following activities in the order of effectiveness?

Drilling emergency boreholes [ ]

Rehabilitation of old boreholes [ ]

Water trucking/Relief water [ ]

Fuel subsidy [ ]

20. What other agencies are involved inthe water provision to the pastoralists?

Other NGOs [ ] Government [ ]

Charitable organizations [ ]

Others (please specify) _____

21. How do you rate the effectiveness of the community in the management of water facilities?

Very effective [ ]

Effective [ ]

Ineffective [ ]

Very Ineffective [ ]

Undecided [ ]

22. In what ways can provision of water be made effective during draught?

_____

_____

Section E: To assess the effectiveness of supplementary feeding of livestock during drought in pastoral sector in Isiolo county

23. Is there supplementary livestock feeding during drought?

Yes [ ] No [ ]

24. How effective is supplementary livestock feeding as mitigation of drought against pastoral livelihood?

Very effective [ ] Effective [ ]

Ineffective [ ] Very ineffective [ ]

Undecided [ ]

25. Is the community involved in the following activities?

Preserving fodder for animals [ ]

Alternative feeding of animals [ ]

Controlled grazing [ ]

26. How do you rate the following activities on supplementary feeding?

Preserving fodder for animals

Very effective [ ]

Effective [ ]

Ineffective [ ]

Very ineffective [ ]

Undecided [ ]

Alternative feeding of animals

Very effective [ ]

Effective [ ]

Ineffective [ ]

Very ineffective [ ]

Undecided [ ]

Controlled grazing

Very effective [ ]

Effective [ ]

Ineffective [ ]

Very ineffective [ ]

Undecided [ ]

APPENDIX 4

QUESTIONNAIRE FOR COMMUNITY CHAIRPERSONS

This questionnaire is designed to find a research project to assess the effects drought mitigation measures on livestock mitigation during drought in Isiolo County The information you give will be treated with absolute confidentiality. Your name shall not appear anywhere therefore, please respond to all items in the questionnaire as honestly and correctly as possible.

Kindly respond to all items

Section A: Demographic data

1. What is the name of your location _____
2. Please indicate your gender

Male [ ]

Female [ ]

3. What is your age?

Below 25 years [ ] 25 – 34 years [ ]

35 – 44 years [ ]45 – 54 years [ ]

Over 54 years [ ]

4. What is your role in the community?

Relief chairman [ ]

Water user association chairman [ ]

Village leader/elder [ ]

Section B: To determine the effectiveness of destocking during drought in pastoral sector in Isiolo county

5. Has your community benefited from Destocking in the last five years?

Yes [ ] No [ ]

6. How effective is it salvaging livestock during drought?

Very effective [ ]

Effective [ ]

Ineffective [ ]

Very ineffective [ ]

Undecided [ ]

7. Was destocking as a mitigation strategy carried timely?

Yes [ ] No [ ]

8. Does the community get value for their animals?

Yes [ ] No [ ]

9. How can destocking be improved in your community?

_____

Section C: To assess the effectiveness of veterinary interventions during drought in pastoral sector in Isiolo county

10. Does your community receive veterinary services in the past five drought seasons?

Yes [ ] No [ ]

11. Is there para- veterinary training to community?

Yes [ ] No [ ]

12. What are the sources of drugs in your community?

Purchase from agro-vet shops [ ]

Government [ ]

NGOs [ ]

Others (Please specify) _____

13. Who are other key partners in the provision of veterinary services to the pastoralists?

The government [ ]

Other NGOs [ ]

Religious organizations [ ]

Others (Please specify)_____

14. How do you rate veterinary interventions support during droughts?

Very adequate [ ] Adequate [ ]

Inadequate [ ] Very inadequate [ ]

Undecided [ ]

Section D: To determined the effectiveness of water provision during drought in pastoral sector in IsioloCounty

15. Who manages the community rural water sources?

Government [ ]

Private companies [ ]

Community self committees [ ]

Others Specify _____

16. How effective are the following approaches in reducing water related risk during drought?

Drilling emergency boreholes

Very effective [ ]

Effective [ ]

Ineffective [ ]

Very ineffective [ ]

Undecided [ ]

Rehabilitation of old boreholes

Very effective [ ]

Effective [ ]

Ineffective [ ]

Very ineffective [ ]

Undecided [ ]

Water trucking/Relief water

Very effective [ ]

Effective [ ]

Ineffective [ ]

Very ineffective [ ]

Undecided [ ]

Fuel subsidy

Very effective [ ]

Effective [ ]

Ineffective [ ]

Very ineffective [ ]

Undecided [ ]

17. How do you rate the following as challenges in provision of water?

Lack fuel

Major challenge [ ]

Not a major challenge [ ]

Maintenance of borehole breakdown

Major challenge [ ]

Not a major challenge [ ]

Overcrowding in the boreholes

Major challenge [ ]

Not a major challenge [ ]

Others (Please specify) _____

18. How effective are the community water user associations in managing water facilities?

Very effective [ ]

Effective [ ]

Ineffective [ ]

Very ineffective [ ]

Undecided [ ]

19. What suggestions would you provide to ensure proper provision of water?

_____

_____

_____

Section E: To assess the effectiveness of supplementary feeding of livestock during drought in pastoral sector in Isiolo county

20. Has the community been receiving livestock supplementary feeds during last drought?

Yes [ ] No [ ]

21. Who are the key players in the provision of supplementary feeding?

_____

2.2.How do you rate the supplementary feeding in draught mitigation?

Very effective [ ]

Effective [ ]

Ineffective [ ]

Very ineffective [ ]

Undecided [ ]

22. Do the following provide supplementary feeding?

GOK [ ]

NGOs [ ]

Community [ ]

23. Does the community play the following roles in supplementary livestock feeding?

Preserving fodder for animals [ ]

Alternative feeding of animals [ ]

Controlled grazing [ ]