

**INFLUENCE OF INDIGENOUS DROUGHT MANAGEMENT
STRATEGIES ON THE LIVELIHOOD SYSTEM OF
PASTORALISTS IN MANDERA WEST SUB COUNTY, KENYA**

BY:

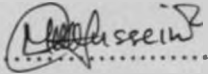
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**A RESEARCH PROJECT REPORT SUBMITTED IN PARTIAL
FULFILLMENT OF THE REQUIREMENTS FOR THE AWARD OF
MASTER OF ARTS IN PROJECT PLANNING AND MANAGEMENT OF
THE UNIVERSITY OF NAIROBI**

2015

DECLARATION

I declare that this research project report is my original work and has not been presented for award of degree in any other university.

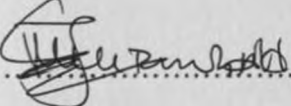
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DEDICATION

I dedicate my research project report to my wife Fatuma Hassan and children, Rukia, Samira, Ahmed, Abdiqani, Shukri, Hassan Noor and Abdifatah for their inspiration, support, patience and encouragement during my studies.

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ABBREVIATIONS AND ACRONYMS

ALRMP	Arid Lands Resource Management Project
APA	American Psychological Association
ASAL	Arid and Semi Arid Land
CBO	Community Based Organization
DFID	Department for International Development
IOM	International Organization for Migration
NDMA	National Drought Management Authority
NGO	Non-Governmental Organization
PA	Pastoralist Association
SLA	Sustainable Livelihood Approach
SLF	Sustainable Livelihood Framework
SPSS	Statistical Package for Social Sciences
UNCCD	United Nations Convention to Combat Desertification
UNDP	United Nations Development Programme
UNFCCC	United Nations Framework Convention on Climate Change
WUA	Water Users Association

ABSTRACT

Drought is a common occurrence in the arid and semi arid lands of Kenya. These frequent and recurrent droughts disrupt the livelihood system of pastoralists, increased their vulnerability and cause loss of livestock. The study aimed at establishing the influence of indigenous drought management strategies on the livelihood system of pastoralists in Mandera West Sub County in Kenya. The study intended to assess the effectiveness of indigenous drought management strategies adopted by pastoralists in Mandera West Sub County in Kenya and its influence on their livelihood system, commonly known as nomadic pastoralism. The target population in the study were pastoralist households and key informants selected from stakeholders involved in the development of the pastoralist communities in Mandera West Sub County in Kenya. The stakeholders included key government departments, institutions and non-governmental organizations in the area. The study employed descriptive survey design where data was collected, analyzed and interpreted for the purpose of comparison and clarification in order to assess the influence of existing indigenous drought management strategies on the livelihood system of pastoralists. The study applied both qualitative and quantitative approaches using household survey and key informant interview guides. Questionnaires were used to collect information from sample pastoralist households and interview and discussion schedules were held with selected key informants using purposive sampling method. Quantitative and qualitative data collected was analysed and cross-examined to establish its accuracy and reliability. Quantitative data was entered and analysed using Statistical Package for Social Sciences (SPSS) to obtain descriptive statistics based on frequencies and percentages to answer the research questions. Qualitative data was used to describe four indigenous drought management strategies in the research objectives. The research established that herd diversification was an appropriate survival drought strategy adopted by pastoralist herders in Mandera West Sub County in Kenya. These strategies have increased the survival of the pastoralist households, reduced loss of livestock herd and have increased their resilience to drought. The study has also established that migration was an effective drought coping strategy adopted by pastoralists during the drought. 46% of the respondents migrated within their traditional grazing areas during the drought, where they moved their herds to relatively dry pastures and 33% preferred to migrate across the border into Southern Ethiopia. The study concluded that water and pasture scarcity had adverse effects on the survival of livestock during the drought and pastoralist households made timely decisions on when to move and when it was best to migrate and established surveillance and traditional early warning systems that helped them in appropriate decision making. The study recommended the exploitation and establishment of water points and facilities across the grazing land, especially underground water to ease concentration of livestock around water points in close proximity to grazing lands which was causing degradation of the pasture land. The study also recommended the need for policy change in the management of communal grazing lands to increase pastoralists' participation in conservation, protection and management of natural resources.

CHAPTER ONE

INTRODUCTION

1.1 Background of the Study

Pastoralism is a term used to describe societies and communities that derive their food and income from keeping livestock. Pastoralism relies on availability of water, pastures and labour in order to thrive and support pastoralist livelihood. Inadequate rainfall limits farming activities in dry and arid lands and pastoralism is the most feasible and consistent viable livelihood (Omosa, 2005).

Drought is the major dominant and frequent hazard affecting Pastoralism. Drought is a slow-onset but complex phenomenon of ecological challenge that affects people more than any other natural hazard in the world. Drought has significant social, economic, and environmental consequences in both developing and developed countries and occurs when there is reduced precipitation over an extended period, usually a season or more relative to the average condition (Agrawal, 2003).

Drought affects both fauna and flora all over the world from the hot deserts to the freezing poles. In North America, drought has afflicted the region for thousands of years. In the 20th century, droughts were particularly severe and widespread in the 1930s and 1950s. In 1934, 65% of the region was affected by severe to extreme drought, resulting in widespread economic disruption and displacement of populations. Drought has persisted across approximately two-thirds of the United States, and had threatened agricultural production and other sectors (Cook et al, 2004).

In India about 300 million people, which is one-third of India's population live in dry drought prone regions and more than 50% of the region is affected by drought once every four years (IDNDR, 1990). The drought prone areas are confined mainly to the peninsular and in the

western parts and there are few pockets of drought prone areas in the central, eastern, northern and southern parts of the country. These regions suffer drought mostly due to the cumulative effects of changing precipitation pattern, excessive water utilization and ecologically unsuitable agriculture practices (Nagarajan, 2003).

In the tropics, Arid and semi-arid regions cover more than one-third of the land surface of the earth and is vulnerable to drought and desertification. Pastoralist communities inhabiting dryland areas of Africa are the most vulnerable to the impacts of drought and have struggled to survive the harsh environments. It is estimated that there are about 120 million pastoralists and agro-pastoralists worldwide and 50 million of the world's pastoralists and agro-pastoralists live in sub-Saharan Africa. Dry lands in sub-Saharan Africa constitute nearly half of the land area where pastoralism is practiced and pastoralists are the majority of the population in these sub-Saharan countries (Nikola, 2006).

Sudan and Somalia have the largest pastoral and agro-pastoral populations of seven million each in Sub-Saharan Africa, followed by Ethiopia with four million. The largest number of pastoral and agro-pastoral livestock is found in sub-Saharan Africa. Sudan has the largest numbers of pastoral and agro-pastoral livestock, comprising of an estimated 18 million cattle, 18 million goats and 22 million sheep (Nikola, 2006).

Drought has been the major dominant and frequent hazard affecting the arid and semi-arid lands (ASALs) of Kenya. Hazards such as drought and floods were experienced in the country in 2000, 2005, 2006, 2009 and 2011. Kenya's current population is 38.6 million, an average per capita income of US\$1,573 and is ranked 128 out of 169 countries in the UNDP's Human Development Index (UNDP, 2011).

The ASAL area constitutes about 82% of the land mass in Kenya and 13% of the national population comprises mainly of pastoralists that supply 70% of the livestock marketed in the

country. Livestock production is the primary livelihood for pastoralists in the arid and semi-arid lands (ASALs) of northern Kenya. Pastoralists move from one place to another in search of scarce resources for their livestock according to the rain patterns. During drought pastoralist livelihoods become less productive and lack the capacity to raise the minimum herd numbers required to maintain their households. They face losses of livestock capital due to higher mortality rates and during droughts are forced to sell off their livestock rather than face their livestock perish and die of starvation (Aklilu, 2001).

The increasing vulnerability of pastoralist livelihoods due to climate change is a problem in the ASAL areas of Kenya. Pastoralist communities remain the most chronically food insecure group in the country experiencing high malnutrition rates, lowest density of health facilities and highest maternal mortality rates. The ASAL populations experience the lowest development indicators and highest incidence of poverty in the country. In the vast northern districts of Turkana, Marsabit, Wajir, Garissa and Mandera 74% to 97% of the population live below the poverty line (UNDP, 2011).

1.2 Statement of the Problem

Mandera County is one of the arid and semi arid counties in Kenya which are affected by recurrent and frequent droughts. Pastoralist communities in the arid and semi arid counties face frequent and recurrent droughts and their capacity to cope with the droughts is reduced since their livestock and livelihood assets become less productive and lack the capacity to sustain the minimum herd numbers required to maintain their households during the drought (Aklilu, 2001).

Drought affects the pastoralists purchasing power and terms of trade which leads to serious livelihood implications leading some of the pastrolists to eventual fallout from the main stream pastoralist life and are forced to move to peri-urban centres to maintain few remaining

animals consisting of goats and sheep as they venture into other new alternative livelihood opportunities in the town settlements to survive (Aklilu, 2001).

Pastoralist communities in the arid and semi arid areas in Kenya have for many years coped with the adverse effects of climate change and have adopted indigenous drought management strategies to continue practicing nomadic pastoralism. Strategies such as herd mobility, migrations and proper utilization and management of scarce natural resources in the dry and drought periods are adopted by pastoralist households to survive. Movement of people and livestock along traditional grazing areas and across international borders are also survival strategies for pastoral communities during the drought. Herd mobility is an important drought management strategy and cross-border migration is an important contributor to mitigating the impact of drought and enhances peaceful co-existence and cohesion between different pastoralist communities during the drought (Aklilu, 2001).

Climate change induced droughts has reduced the capacity and ability of pastoralist communities to cope with droughts and the study aimed at examining the influence indigenous drought management strategies have on the continued survival of pastoralists in the arid and semi arid lands of Kenya.

The study assessed the influence of indigenous drought management strategies on the livelihood system of pastoralists in Mandera West Sub County in Kenya. Previous studies conducted in North Eastern region of Kenya were on pastoralists' drought early warning and drought coping mechanisms and therefore there was need for more information on their influence on the pastoralism livelihood system and hence this study explored the existence of indigenous drought management strategies and their influence on the mainstream livelihood system which is nomadic pastoralism.

1.3 Purpose of the Study

The purpose of this study was to establish the influence of indigenous drought management strategies on the livelihood system of pastoralists in Mandera West Sub County, Kenya

1.4 Objectives of the Study

The objectives of the study were:-

1. To examine the influence of herd management strategies on the livelihood system of pastoralists in Mandera West Sub County, Kenya.
2. To establish the influence of water management strategies on the livelihood system of pastoralists in Mandera West Sub County, Kenya.
3. To assess the influence of grazing management strategies on the livelihood system of pastoralists in Mandera West Sub County, Kenya.
4. To determine the influence of migration strategies on the livelihood system of pastoralists in Mandera West Sub County, Kenya.

1.5 Research Questions

The study was guided by the following research questions:-

1. What is the influence of herd management strategies on the livelihood system of pastoralists in Mandera West Sub County, Kenya?
2. What is the influence of water management strategies on the livelihood system of pastoralists in Mandera West Sub County, Kenya?
3. What is the influence of grazing management strategies on the livelihood system of pastoralists in Mandera West Sub County, Kenya?

4. What is the influence of migration strategies on the livelihood system of pastoralists in Mandera West Sub County, Kenya?

1.6 Significance of the Study

The study and its findings have provided significant and important information for enhancing pastoralist communities' resilience to drought. Previous studies on pastoralist vulnerability to drought lack sufficient information on the effectiveness of indigenous drought management strategies on pastoralism livelihood system and its contribution to sustainable livelihood.

The study established the existence of significant indigenous drought management strategies that support pastoralist household's preparedness and response to droughts. The findings of the study will enhance conventional drought mitigation and response interventions at national and county levels and reduce loss of livestock during recurrent droughts. The study will provide government and agencies working in arid lands where pastoralist communities live, practical and effective indigenous drought management strategies pastoralists adopt to survive the drought and enhance the pastoralism livelihood system.

The study will be useful to stakeholders and implementing agencies working with pastoralist communities in the planning and implementation of drought mitigation and response activities and promote community participation. The findings and conclusions of this study will add value to existing literature on pastoralist drought coping strategies and drought management at large and will be of use to scholars in future in the study of pastoralist drought preparedness and management.

1.7 Assumptions of the Study

The main assumption of the study was that the drought spell and insecurity experienced in northern Kenya during the research period might affect field data collection. However the

field survey coincided with the March-April long rains and the insecurity experienced in the area had improved.

It was anticipated that the study would contribute to understanding of indigenous drought management strategies adopted by pastoralist in northern Kenya and offer an opportunity to assess the influence of the indigenous drought management strategies on the livelihoods of pastoralist in Mandera West Sub County in Kenya.

1.8 Limitations of the Study

The study was expected to be carried out in a vast dry area during the drought or dry season when pastoralists were likely to migrate long distances across the border and into neighbouring districts and counties. Reaching pastoralist households in the interior remote grazing areas was anticipated to be a major challenge. This limitation was addressed through timely visits at watering points and pastoralist homesteads with support from aid agencies and the sub county government in the study area.

1.9 Delimitation of the Study

The study targeted pastoralist communities living along the Kenya-Ethiopia border in Mandera West Sub-County in Mandera County in Kenya. The pastoralists live in vast and disperse areas which are characterized by poor road networks and poor communication facilities.

The researcher and field assistance team were able to communicate in the local language and this reduced distorting of information given by the respondents through interpreters and reduced time spent in translations and enhanced effective participation of the local pastoralist households and the local leaders.

1.10 Definitions of Significant Terms Used in the Study

Climate Change refers to a change of weather that is attributed directly or indirectly to human activity that alters the composition of the global atmosphere and that is in addition to natural climate variability observed over comparable time periods (UNFCCC - United Nations Framework Convention on Climate Change).

Drought according to the US National Drought Policy Commission is defined as a persistent and abnormal moisture deficiency having adverse impacts on vegetation, animals, or people and the United Nations Convention to Combat Desertification UNCCD defines drought as the naturally occurring phenomenon that exists when precipitation has been significantly below normal recorded levels, causing serious hydrological imbalances that adversely affect land resource production systems.

Early Warning refers to the provision of timely and effective information, through identified institutions, that allows individuals exposed to a hazard to take action to avoid or reduce their risk and prepare for effective response.

Livelihood refers to a means of making a living. It encompasses people's capabilities, assets, income and activities required to secure the necessities of life. A livelihood is sustainable when it enables people to cope with and recover from shocks and stresses (such as natural disasters and economic or social upheavals) and enhance their well-being and that of future generations without undermining the natural environment or resource base.

Mitigation is the structural and non-structural measures undertaken to limit the adverse impact of natural hazards, environmental degradation, and technological hazards.

Natural Hazards are natural processes or phenomena occurring in the biosphere that may constitute a damaging event. Natural hazards can be classified by origin, namely: geological,

hydro-meteorological, or biological. Hazardous events can vary in magnitude or intensity, frequency, duration, area of extent, speed of onset, spatial dispersion, and temporal spacing.

Preparedness are activities and measures taken in advance to ensure effective response to the impact of hazards, including the issuance of timely and effective early warnings and the temporary evacuation of people and property from threatened locations.

Prevention is activities aimed at providing an outright avoidance of the adverse impact of hazards and means to minimize related environmental, technological, and biological disasters. Depending on social and technical feasibility and cost/benefit considerations, investing in preventive measures is justified in areas frequently affected by disasters. In the context of public awareness and education, related to disaster risk reduction, changing attitudes and behavior contributes to promoting a “culture of prevention.”

Response refers to the provision of assistance or intervention during or immediately after a disaster to meet the life preservation and basic subsistence needs of those people affected. It can be of an immediate, short-term, or protracted duration.

Resilience is the capacity of a system, community, or society potentially exposed to hazards to adapt, by resisting or changing in order to reach and maintain an acceptable level of functioning and structure. This is determined by the degree to which the social system is capable of organizing itself to increase its capacity for learning from past disasters for better future protection and to improve risk reduction measures.

Vulnerability is the condition determined by physical, social, economic and environmental factors or processes, which increase the susceptibility of a community to the impact of hazards.

1.11 Organization of the Study

The research report consists of five chapters. Chapter one provides detailed introduction and background of the study, the 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 focuses on the variables as indicated in the objectives of the study. The review provides literature on previous work related to the study and gives an indication of the need for more research in the study area.

Chapter three contains the research methodology which consists of the research design, target population, sample of the study, sampling procedures, research instruments and data collection procedures, piloting of research instrument and data analysis techniques.

Chapter four presents data analysis, presentation and interpretation of findings. The findings of the response rate, demographic information and data analysis of the research questions derived from the research objectives.

Chapter five gives comprehensive summary of findings with corresponding discussions of the findings, conclusion of the study, recommendations and suggestions for further research.

CHAPTER TWO

LITERATURE REVIEW

2.1 Introduction

This chapter provides an indepth review of previous research on pastoralism as a livelihood system and the indigenous drought management strategies adopted by pastoralists. The review was necessary as it enabled the study to develop new knowledge from the gaps identified in the literature which was used to further explore pastoralists' indigenous drought management strategies in arid and semi arid areas in Kenya and its influence on the livelihood system of pastoralists based on the themes of the study, which were derived from the objectives of the study. To illustrate the relationships between the variables, a conceptual framework was developed.

2.2 Pastoralism Livelihood System

Pastoralism is a livelihood and production system practiced by pastoralists in the arid and semi-arid lands of Africa. The land cannot support and sustain agriculture due to extreme variability of weather patterns and pastoralists in these dry areas have adapted to the climatic variability to maximize the productivity of their livestock herds. They practice strategies such as livestock mobility and breeding of animals capable to withstand hard conditions (Pratt, 2010).

In the ASAL areas of northern Kenya where nomadic pastoralism is practiced, the pastoralist livestock herders move long distances in search of scarce resources for their livestock according to the rain patterns. These movements are within their traditional grazing borders and across international borders during severe droughts as the remaining available pasture and sources of water diminish and conditions worsen. Pastoralism develops to get the most out of the opportunity provided by a surfeit of water and other resources in good seasons, and

face losses in low seasons. Pastoralists increase their livestock numbers in good seasons to maximize available resources and carry over enough healthy stock to provide for subsistence during the dry seasons (Eileen, 2005).

According to Umar (1994), Pastoralism is a highly flexible system and the practice has evolved over time as the most efficient means of exploiting transient water under ecologically marginal conditions and prevailing technological and economic situations. The pastoral resource-use pattern is characterized by risk-spreading and flexible mechanisms, such as mobility, communal land ownership, large and diverse herd sizes and herd separation and splitting. The mixture of livestock is a system to manage risk. Small stock like goats and sheep, although more vulnerable to disease when compared to large stock, are cash buffers, for they have a high reproduction rate and they lactate during dry periods.

Pastoralist livelihood strategies have evolved over centuries in response to low and erratic rainfall and diverse ecosystems typical of the arid and semi arid lands that pastoralists inhabit. In accessing and managing natural resources, mainly grazing land and water sources, pastoralists employ a variety of herd management strategies such as splitting of the herd, diversification and maximization and maintain high levels of mobility across large tracts of land, to make the most effective use of the scarce resources. These strategies which are used to manage the natural resources over time and space have allowed pastoralists to adaptively manage the threats and risks that characterize their eco-system, enabling them to maintain a viable and resilient production and livelihood system (Smith *et al*, 2001).

The impact of recurrent droughts over the past decades in the Horn and East Africa has been disastrous, causing massive livestock losses, acute rates of malnutrition and high morbidity and mortality among pastoralist communities. Indigenous drought strategies have come under significant strain and the capacity of pastoralists to resist and recover from drought-related shocks has deteriorated (Pratt, 2010).

2.3 Indigenous Drought Management Strategies

Pastoralist communities adopt different strategies when faced with difficult circumstances. Indigenous drought management strategies are adapted by pastoralist households when confronted with unanticipated events that can cause livelihood failure. Drought management strategies to shocks such as drought and floods differ among pastoralist households and communities depending on the economic activities, the types of resources and the social networks they can access. Activities may range from migrating to other areas, switching to non-farming activities, collection of wild fruits, depending on remittances or in extreme cases sale of assets (Ellis, 2000).

Droughts or periods of unusually low rainfall are part of the expected pattern of precipitation in pastoral areas in East Africa. Pastoralists deal with these fluctuations by moving their herds to areas of higher precipitation and to drought-time grazing reserves. The greater their flexibility the more they are able to survive drought (Blench, 2000)

Other management strategies adopted by pastoralists during the drought period include splitting of stock, splitting labour and some youth seeking employment and women engaging in petty trade. Households distribute their livestock among relatives and family members as an insurance against total loss due to drought, enabling them to restock and ensuring post drought recovery and continued survival. After the drought, smaller stock reproduces more rapidly, allowing the herd to recover and serving as capital which can be exchanged for larger animals such as camel later on. Rebuilding a herd of camels is an expensive and slow process (Smith *et al.*, 2001).

Drought management strategies vary depending on the stage of severity of the drought such as mild, medium and acute stages of drought. There are also differences between different households in a given community arising from differences in capabilities to respond to food

stress due to drought. The most vulnerable people to droughts are those who struggle to survive in vulnerable households even under normal circumstances, and their ability to mitigate this vulnerability is dependent upon their abilities to adapt. People in vulnerable systems, like the pastoralists in Afar and Borana in Ethiopia, are more likely to pursue adaptive strategies, seeking to use all available options at all times to survive and to preserve assets for future livelihoods (Fasil *et al.*, 2001).

Drought management strategies are constrained by rising human populations along with changes of land tenure that have squeezed pastoral livestock onto areas that are too small for sustainable pastoral production (Galvin *et al.*, 2001). Indeed in many cases local management strategies by pastoralists may no longer be sufficient during prolonged drought seasons (Oba, 2001).

According to IOM (2010) report, the preferred drought mitigation measures in North Eastern Kenya are preservation of pastures (47%), the sale of livestock before the onset of drought (23%), construction of additional water reservoirs (15%), engagement in income generating activities (12%) and movement of livestock within and outside the national boundaries (3%).

Vulnerability to frequent droughts in pastoral areas can be reduced through harmonization of pastoralist practices and national policies paying attention in particular to pastoral representation and involvement in the policy formulation process. This will ensure pastoralist management capacity is strengthened and management strategies enhanced by appropriate and timely interventions. Poverty and vulnerability in pastoral areas is mainly exacerbated by inappropriate government policies and development interventions that undermine pastoral systems and strategies for responding to environmental stresses (Hesse and Odhiambo, 2002).

Pastoralists derive their food and income mainly from their livestock. Some pastoralists also practice shifting cultivation during the rains and carry out other economic activities to meet

their subsistence needs. The mobility of the pastoralists enables them to make the most productive use of drought-prone rangelands. Livestock production is the primary livelihood of pastoralists in the arid and semi-arid lands (ASALs) and Pastoralism makes a significant contribution to Kenya's economy with livestock production accounting for 50% of the Gross Agricultural Production (GAP) and 26% of the total National Agricultural Production (NAP). Over 70% of the country's livestock are found in the ASAL areas (Davis, 2006).

2.3.1 Herd Management Strategies

The key strategy pastoralists adopt to cope with drought is herd mobility which aims at exploiting spatially the different vegetation types in the rangelands and enhance livestock productivity (Galvin et al, 2001). Herd mobility as a strategy requires a favorable environment in terms of land tenure and land use to allow access to natural resources.

Campbell (1999) noted that despite increased diversification of livelihood sources in South East Kajiado during the droughts of 1972-1976 and 1994-1995, mainly through rainfed agriculture, horticulture and tourism, herd movement strategies were still applied. This means despite pastoralists looking to alternative livelihood sources during drought, the main focus is to protect livestock which is their main livelihood.

In northern Kenya, livestock is critical to pastoral livelihoods and the more mobile the pastoral systems are the higher the chances of reduced livestock loss. The adoption of drought tolerant species and breeds of livestock ensures a more sustainable pastoralist system to drought. In the drier areas, camels are a key species which require little water and can cover a wider range across large expanses of the drier rangelands in Kenya. Camels are found in Somali, Gabra, Rendille, and Turkana dryland areas in Kenya (Rich and Wanyoike, 2010).

Among dryland pastoral groups like the Karamojong of Uganda, mobility is critical to the viability of survival strategies. Through livestock mobility using different grazing areas in the

wet and dry seasons, pastoralists avoid overgrazing and try to ensure that grazing areas remain productive (Orindi .2005). Attempts at making the Karamojong pastoral community in Northern Uganda practice ‘modern’ agriculture and ‘controlled’ grazing failed because they were in direct conflict with the long held tradition of transhumance in most parts of Karamoja (Moyini. 2004).

Sale of livestock during the drought is a common drought management strategy among pastoralists. Access to markets allows households to sell livestock and livestock products easily without significant transportation costs and to purchase grains, medicines and other household items. Livestock trade represents over 90% of pastoralists’ incomes and close proximity to towns and access local markets enables households to make sound and informed decisions about their livestock holdings. With access to market pastoralists’ diet have changed from predominately livestock products to grains such as maize and millet (Rich and Wanyoike, 2010).

Splitting of herds during the drought is prevalent among pastoralists in East Africa. Some communities divide their herds into core and satellite herds. The satellite herds constitute of males and dry females of the generally larger livestock species such as cattle and donkeys that are moved far afield in search of water and pasture. Small ruminants such as goats and sheep and the breeding stock constitute the core herds and are left at the homestead where women and children care for them (Pratt, 2010).

Barton *et al.* (2001) argued that management strategies and adaptive strategies sometimes overlap because livestock mobility, livestock marketing and livelihood diversification are both management and adaptive strategies. On the other hand, Fasil *et al.* (2001) and Barton *et al.* (2001) similarly argued that management strategies are useful in the short term, but do not necessarily bring a change in livelihoods.

2.3.2 Water Management Strategies

Many of the inhabitants of the arid and semi-arid rangelands of sub-Saharan Africa gain their livelihood from pastoral activities, utilizing communal water and grazing resources to keep their livestock. They live under highly variable climatic conditions, with their herds subject to large variations in water and feed availability. Managing these strong fluctuations in pastoral livelihoods is the main development challenge facing humanitarian and development agencies seeking to support pastoral development (Birch and Shuria, 2001).

One of the most limiting factors to livestock productivity during drought periods is inadequate water supplies for livestock since the rains are erratic and highly variable. The main source of water during good rains is the water pans that provide water for livestock which dry up due to excessive evaporation rates. During the dry season the pastoralists move their livestock to lowlands and use wells, rivers and boreholes to water their animals. Livestock herders in the traditionally communal grazing areas water their animals from hand-dug shallow wells in the valleys and boreholes (Pratt, 2010).

Appropriate water development reduces animals concentrating and converging in smaller areas over a long period of time which potentially causes overgrazing, poor livestock health and land degradation around watering points. Appropriate development of water points can be achieved where pastoralist groups and communities are involved in planning and implementation of water development initiatives. For example, an issue that may be particularly pertinent to pastoralist adaptation to climate change may be the provision of watering points that are well planned in relation to available grazing areas. Adequate spacing of water points in pastoral areas is important to make larger areas available for grazing during dry spells. Water availability rather than lack of grass is often the main factor constraining grazing in many dryland areas (Pratt, 2010).

In the ASALs, water is limited both in terms of quality and quantity. Long periods of scarcity of water imply that the communities have evolved mechanisms of managing the little water that is available so as to provide for their needs. The pastoralists apply rules, regulations and penalties as one way to achieve sustainable water management in the midst of scarcity. Access to water is controlled by group membership so that unauthorized use may be met with persuasion, force or legal action. Non-members are only allowed access after making substantial payments or agreements (Omosa, 2005).

2.3.3 Grazing Management Strategies

Pastoralists move their household and livestock to better grazing lands to cope with environmental shocks such as drought. A key feature of pastoralism in African is mobility where livestock herds are able to move to distant grazing areas along traditional migration routes and across international borders in times of drought emergency to areas where grass and browse is available. Pastoralists move their herds to areas of higher precipitation which are drought-time grazing reserves. The greater their flexibility and mobility the more they are able to survive the drought (Blench, 2000).

Pastoral groups have been able to survive in the dryland areas using a combination of grazing management strategies like migration, rotational grazing and communal land ownership and have rich traditional practices and management strategies that have promoted their survival in adverse climatic conditions (Birch and Shuria, 2001).

Grazing management during drought is both complex and sensitive and need to be handled carefully by incorporating traditional land grazing systems and norms that allow pastoralists freedom of movement in search of pasture with conventional and administrative methods. National laws and regulations should recognize and integrate traditional systems of land ownership and use in formal laws to safeguard traditional grazing lands (Blench, 2000).

Reducing animal population in grazing areas may be an adaptation measure to reducing pressure on grazing lands, however reduced livestock productivity may actually increase pastoral vulnerability. Barton et al (2001) noted that the concept of 'carrying capacity' varies in relation to the composition of the herd and its movement and that absolute number of animals grazed may be less important than the way they are grazed.

2.3.4 Migration Strategies

Migrations and movements in search for water and forage for their livestock and for their own use is an inherent strategy for pastoralists as drought intensifies. Pastoralists live in adverse climatic conditions and are vulnerable to the effects of climate change especially droughts whose frequency is rising with increasing global warming (Blench, 2000).

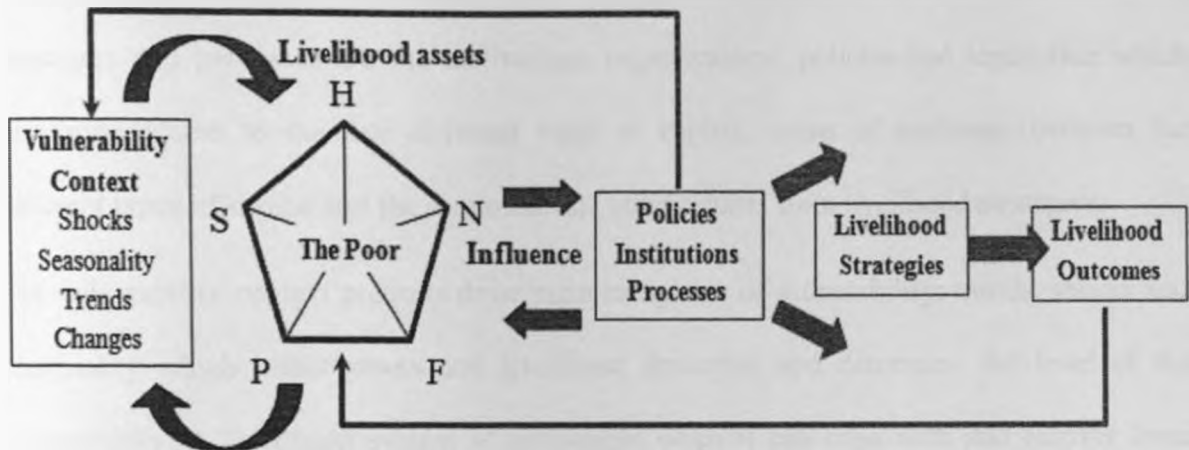
Studies have shown that distance trekked to livestock water sources almost triple during the drought, from an average of 5.9 km pre-drought to 15.8 km during the drought and nomadic pastoralists trek greater distances than agro pastoralists. Distances to grazing sites also increase, from an average of 5.5 km pre-drought to 20.4 km during the drought, with pure pastoralists trekking greater distances than agro pastoralists (Kivaria, 2006).

Long-distance migration management strategies are generally employed when the severity of drought and its spatial distribution are ascertained. Until complete information is available, households reduce risks associated with migration and gain time needed for reciprocal resource sharing agreements to be negotiated among the household and community members, as directed and agreed by elders in the communities (Aklilu, 2001).

2.4 Theoretical Framework

The Sustainable Livelihood Approach (SLA) is employed in this study to establish the influence of drought management mechanisms on livelihood strategies.

SLA is defined as a multiple assets approach where sustainability is examined in terms of available assets and an assessment of their vulnerability context i.e. shocks, stress and trends, and in relation to policy and the institutional context within which assets exist (DFID, 2004).



S=Social Capital, H=Human, N=Natural, F=Financial, P=Physical

Figure 2.1: Sustainable Livelihoods Framework. (Source: DFID 2004)

The Sustainable Livelihoods approach places people, particularly pastoral communities, in the centre of a network of interrelated influences that affect how they create a livelihood for themselves and their households.

Pastoralists have assets which they have access to including livestock, natural resources, skills, knowledge, sources of credit, education and social networks. The extent of their access to assets is influenced by the vulnerability context. This takes account of shocks (e.g. droughts, epidemics), trends (e.g. economical and political) and seasonality (e.g. prices). Access is also influenced by the prevailing social, institutional and policy environment, which affects the ways in which pastoralists relate and use their assets to achieve their livelihood goals.

The Sustainable livelihood approach groups individual into different livelihoods according to their access to assets, including both material and social resources and their capabilities to

combine them to livelihood strategies for a means of living. The model breaks access into the five 'capitals' human, natural, financial, social and physical capital.

The ability to combine these assets to livelihood strategies is influenced by the prevailing transforming structures and institutions and the vulnerability context. The transforming structures and processes are the institutions, organizations, policies and legislation which determine access to the five different types of capital, terms of exchange between the different types of capital and the economic and other returns from livelihood strategies.

The vulnerability context presents three main categories of vulnerability: trends, shocks and seasonality which affect assets and livelihood strategies and determine the level of the vulnerability. A livelihood system is sustainable when it can cope with and recover from stresses and shocks and maintain or enhance its capabilities and assets both in the present and in the future, while not undermining the natural resource base (DFID, 2004).

2.5 Conceptual Framework

Independent Variables

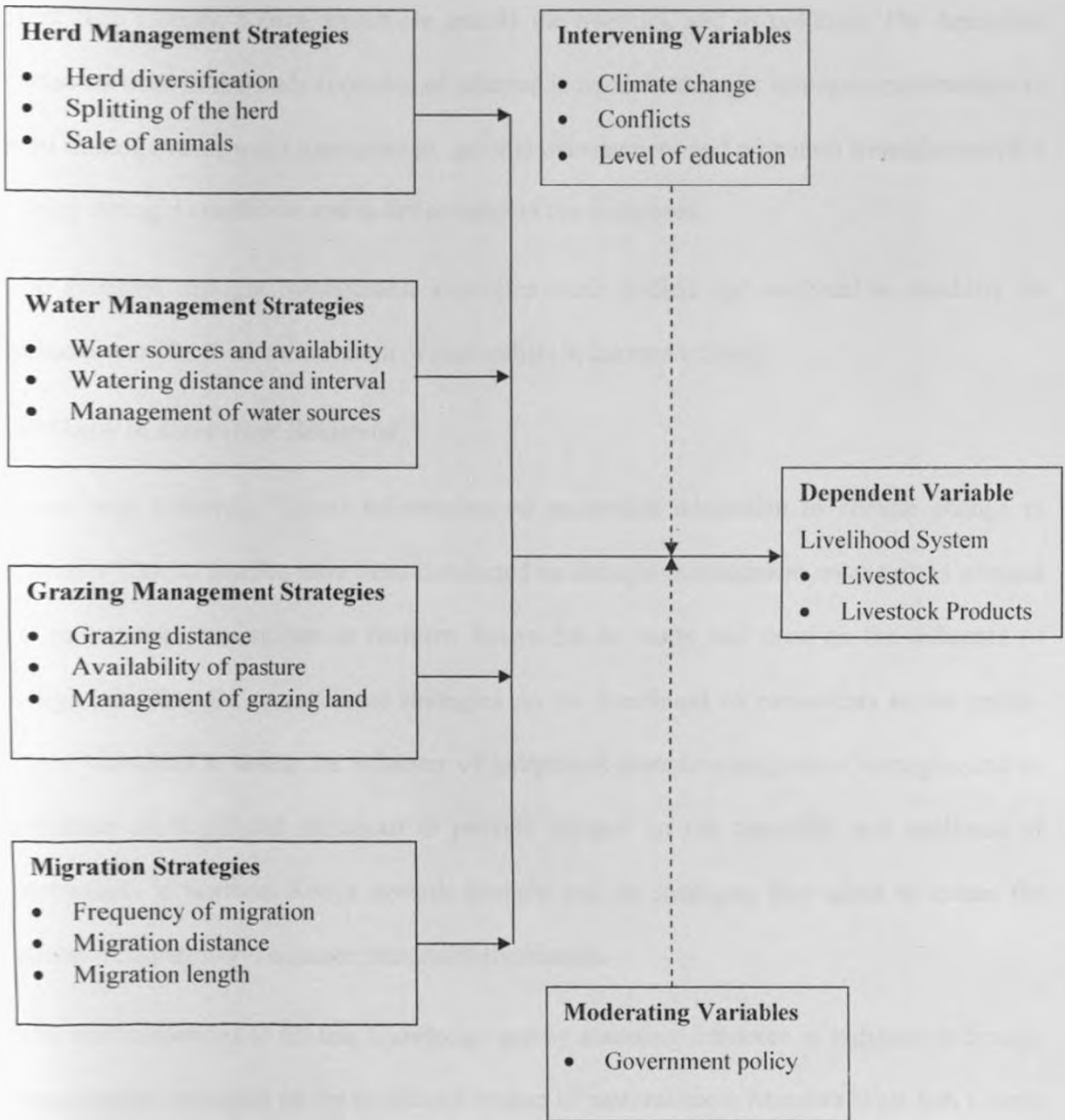


Figure 2.2: Conceptual framework

2.6 Explanation of Relationships of Variables in the Conceptual Framework

The independent variable in the study was the livelihood system of pastoralists in Mandera West Sub County, Kenya, which are mainly the livestock and its products. The dependent variables used in the study consisted of selected indigenous drought management strategies in herd management, water management, grazing management and migration strategies adopted during drought conditions and in dry seasons in the study area.

The selected drought management strategies were studied and analysed to establish its influence on the livelihood system of pastoralists in the area of study.

2.7 Gaps in Literature Reviewed

There was relatively limited information on pastoralist adaptation to climate change in northern Kenya. Studies have been conducted on drought management mechanisms adopted by pastoralist communities in northern Kenya but no study was done on the influence of indigenous drought management strategies on the livelihood of pastoralists in the region. There was need to assess the influence of indigenous drought management strategies and its influence on livelihood variations to provide insights on the capability and resilience of pastoralists in northern Kenya towards drought and the strategies they adopt to reduce the effects of drought and enhance pastoralist livelihoods.

This study intended to fill this knowledge gap by assessing influence of indigenous drought management strategies on the livelihood system of pastoralists in Mandera West Sub County in Kenya.

2.8 Summary of Literature Review

The review of literature on pastoralism and indigenous drought management strategies of previous research supported the rationale for conducting the study on the influence of

indigenous drought management strategies on the livelihood system of pastoralists in Manderu West Sub County in Kenya.

The review further expounded on four indigenous drought management strategies; namely herd management, water management, grazing management and migration strategies to explore the effectiveness of the indigenous drought management mechanisms that supported the pastoralist livelihood system referred to as pastoralism to survive.

CHAPTER THREE

RESEARCH METHODOLOGY

3.1 Introduction

This chapter covers the research methods, techniques and tools used to carry out the study. It provides information on the research design, target population, sample and sampling procedures, research instruments, validity and reliability of instruments, data collection procedures and data analysis procedures.

3.2 Research Design

Research design is the overall plan or strategy for conducting a research. The research design assists the researcher in collecting, measuring and analyzing the data (Coopers & Schindler, 2006). The research employed descriptive survey design to gather information, analyze and interpret for purpose of comparison and clarification to assess the influence of declining drought management strategies on the livelihood system of pastoralists in Mandera West Sub County, Kenya.

Descriptive survey design is used in exploratory and investigative studies (Creswell, 2003) and is appropriate for this study in order to determine an existing situation in the field and hence no variable will be manipulated. Descriptive research determines and reports the way things are and answers questions concerning the subjects in the study. Mugenda & Mugenda (2003) consider that descriptive research design method is appropriate for studies that look into specific issues where there is a clear definition of the problem.

3.3 Target Population

Target population is defined as all the items or people under consideration in a study area (Orodho, 2004). The study target population comprised of pastoralist households and

stakeholders involved in pastoralist development and intervention activities in the area. The Target population is shown in Tables 3.1 and 3.2.

Table 3.1: Mandera County Population distribution – 2009 Census

Constituency	Male	Female	Total	No of Households	Land Area (Sq. Km.)	Density (Persons)
Mandera West	174,807	144,968	319,775	36,799	8,134.70	39
Mandera Central	225,579	191,715	417,294	50,226	11,682.70	36
Mandera East	159,557	129,130	288,687	38,472	6,174.10	47
Total	559,943	465,813	1,025,756	125,497	25,991.50	41

(Source: KNBS 2009 Kenya Population and Housing Census 24th-25th August 2009)

Table 3.2: Mandera West district Population distribution – 2009 Census

Location	Male	Female	Total	Households	%	Area in sq km
Rural	161,628	134,022	295,650	34,273	92.5%	8,120.05
Urban	13,179	10,946	24,125	2,526	7.5%	14.63
Total	174,807	144,968	319,775	36,799	100.0%	8,134.68

(Source: KNBS 2009 Kenya Population and Housing Census 24th-25th August 2009)

3.4 Sample Size and Sampling Procedures

Sampling is defined by Orodho (2004) as the process of selecting a subset of cases in order to draw conclusions about the entire set. Sampling helps in understanding a large group by studying a few of its members which saves both time and resources.

The study employed Stratified sampling. In this sampling technique the entire population of interest was divided into sub-groups known as strata and each stratum was randomly selected. The selected strata consisted of pastoralist households, representatives of national and county governments, community leaders, institutions and non-governmental organizations in Mandera West Sub County in Kenya.

The rural population of Mandera West Sub County which is mainly pastoralists, was 295,650 individuals (34,273 Household families) which represented 92.5% of the total population and with a Margin Error (Confidence Interval) of +/- 5%, Confidence level of 95% and standard deviation of 5 and the sample size was calculated as follows:-

Sample Size = $(Z\text{-score})^2 \times \text{StdDev} \times (1\text{-StdDev}) / (\text{Margin of Error})^2$

$$n = \left[\frac{z_{\alpha/2} \sigma}{E} \right]^2$$

$$= ((1.96)^2 \times .5(.5)) / (.05)^2$$

$$= (3.8416 \times .25) / .0025$$

$$= 0.9604 / .0025$$

$$= 384.16$$

Therefore 385 respondents were taken as the Sample Size.

The sample size is presented in Table3.3

Table 3.3: Sample size

Category	Population size	Percentage %	Sample size
Pastoralist Households	1165	30	350
Community Leaders	30	30	9
Sub-County Representatives	21	30	6
Sub-County Government Representatives	17	30	5
Government Line Ministries Staff	25	30	8
Sub-County NDMA Staff	7	30	2
NGO Staff	19	30	6
Total	1284		385

3.5 Data Collection Instrument

Semi-structured questionnaires and interviews guides were used to collect information for the study. Questionnaires are useful in the study since it gathers data over a large sample (Kombo and Tromp, 2006) and helps the person administering the instrument to establish rapport with the respondents and explain the purpose of the study. Questionnaires give the respondents the freedom to express their views or opinions openly and make suggestions.

3.5.1 Validity of the Instrument

According to Mugenda and Mugenda (2003) validity refers to the accuracy and meaningfulness of inferences based on the research result. The research data collection in the field will be administered through questionnaires and interviews through focus group discussions. The researcher will test and improve the validity of the instruments in the field.

3.5.2 Reliability of the Instrument

Mugenda and Mugenda (2003) defines reliability as a measure of the degree to which a research instrument yields consistent results or data after repeated tests are administered a number of times. To enhance the reliability of the instrument, pre-testing of the instrument items for clarity and relevance was conducted in order to identify and discard irrelevant and inadequate items used for measuring the variables and to modify and improve the quality of the research instruments to capture the required data.

3.6 Data Collection Procedures

The researcher sought research permit from the national council for science and technology and letter of introduction from the University of Nairobi and provide copies to the sub-county commissioners to assist in the research by allowing access in the study area and facilitate meetings with the respondents at agreed places and time.

3.7 Data Analysis Techniques

Data was collected and cross-examined to establish its accuracy and short comings were identified such as items wrongly not responded to, spelling mistakes distorting significance and blank spaces not filled. Quantitative data collected was entered and analysed using the Statistical Package for Social Sciences (SPSS) computer package system to obtain descriptive statistics such as percentages and frequencies to answer research questions and Qualitative data was used to analyze the data according to the themes in the research objectives. APA format style Tables were used to present the data collected and analysed. The data analysis was to establish the relationship between the dependent and the independent variables.

3.8 Ethical Considerations

The researcher assured respondents that information given by them was confidential and that the information collected was meant exclusively only for university research work.

3.9 Operational Definition of the Variables

Table 3.4: Operational definition of variables

Research Objectives	Variables	Indicators	Measuring Scale	Type of analysis
To examine the influence of herd management strategies on the livelihood system of pastoralists in Mandera West Sub County, Kenya.	Independent Livestock herd management strategies	<ul style="list-style-type: none"> • Herd diversification • Splitting of the herd • Sale of animals 	Interval, Ratio	Descriptive
To establish the influence of water management strategies on the livelihood system of pastoralists in Mandera West Sub County, Kenya.	Water management strategies	<ul style="list-style-type: none"> • Water sources and availability • Watering distance and interval • Management of water sources 	Interval, Ratio	Descriptive
To assess the influence of grazing management strategies on the livelihood system of pastoralists in Mandera West Sub County, Kenya.	Grazing management strategies	<ul style="list-style-type: none"> • Grazing distance • Availability of pasture • Management of grazing land 	Interval, Ratio	Descriptive
To determine the influence of migration	Migration strategies	<ul style="list-style-type: none"> • Frequency of migration 	Interval	Descriptive

strategies on the livelihood system of pastoralists in Mandera West Sub County, Kenya.		<ul style="list-style-type: none"> • Migration distance • Migration length 		
	Dependent Livestock production, milk production and livestock sale	Improved herd size, improved livestock products (meat and milk), livestock sale and assets	Ratio	Descriptive

CHAPTER FOUR

DATA ANALYSIS, PRESENTATION AND INTERPRETATION OF FINDINGS

4.1 Introduction

This chapter presents data analysis, presentation and interpretation of the findings. The findings were arranged and put into sub-sections on response rate, demographic information and data analysis of the research questions derived from the research objectives were addressed in four main themes. Data was collected from sampled pastoralist households on the four themes i.e. herd management strategies, water management strategies, grazing management strategies and migration strategies and their influence on the livestock system were presented in APA style table format. The household questionnaire and key informants interview schedule employed in the study are presented in Appendix 2 and 3 respectively.

4.2 Questionnaire Return Rate

The study target sample size was 385 consisting of 350 pastoralist households and 36 key informants. The summary of the response rates are summarized in Tables 4.1 and 4.2.

Table 4.1: Response rate

Type of respondent	Number of questionnaires issued	Number of Questionnaires returned	Response rate
Household	350	263	75%
Key Informants	36	19	53%
Total	386	282	73%

Table 4.1 shows that a total of 263 questionnaires were returned giving a response rate of 75% and nineteen key informants interviewed giving a response rate of 53% which gives

cumulative response rate of 73% which was found to be significant enough to establish the objectives of the study.

The study collected information from all the five locations of Mandera West Sub-county, also referred to as County Assembly Wards.

The response rate per location was analyzed and summarized in Table 4.2.

Table 4.2: Response rate per geographical location

No.	Location / County Assembly Ward	Planned Sample Size	Actual Sample Size	%
1	Gither	60	47	78%
2	Takaba	80	68	85%
3	Takaba South	70	66	94%
4	Dandu	75	42	56%
5	Lag Sure	65	40	62%
Total	5	350	263	75%

Table 4.2 shows that the response rate was highest in Takaba South with 66 samples (94%), followed by Takaba with 68 samples (80%). The lowest was Dandu with 42 (56%). Dandu location borders Ethiopia and many pastoralist households in the location migrated across the border into southern Ethiopia in search of greener pastures.

4.3 Demographic Characteristics of Respondents

In order to understand the characteristics of the population, respondents were asked to indicate their gender, age, household size, level of education, number of children attending school and income.

4.3.1 Gender of Respondents

The respondents in the Households surveys were asked their gender. The findings of the 263 household respondents are summarized in Table 4.3.

Table 4.3: Response on gender

Gender	Frequency	Percentage
Male	115	44%
Female	148	56%
Total	263	100%

Table 4.3 shows that female respondents were 148(56%) and male were 115(44%). The findings revealed that there were more female than male at the homesteads, which is a reflection of gender roles and responsibilities where women are left in the care of the home while men herd the livestock in the distant grazing lands.

4.3.2 Age Category of Respondents

The study sought to find out the age category of the respondents. The respondents were asked to state their age and the response was summarized in Table 4.4.

Table 4.4: Age of respondents

Age category (Years)	Frequency	Percentage
Below 25	48	18%
25-35	77	29%
36-45	82	31%
Over 45	56	21%
Total	263	100%

Table 4.4 shows that 31% of the respondents were of age category of 36-45 years, followed by 29% in age category of 25-35 year, 21 % of the respondents were of age category of over

45 years and 18 % were below 25 years. Cumulative 79% of the household respondents were youth, which reflects an indication of youthful population suited to the hardship of the pastoralist life associated with long distance trekking in search of pasture and water for livestock and human use.

4.3.3 Response on Household Size

The study sought to find out the size of the pastoralist households and the findings was summarized in Table 4.5.

Table 4.5: Response on household size

Household size	Frequency	Percentage
1-3	38	14%
4-7	147	56%
8-15	78	30%
Total	263	100%

Table 4.5 shows that the pastoralist households have high household size. 56% have household size of 4-7 members, followed by 30% of household size of 8-15 members and the lowest 14% have 1-3 members. This reflects the polygamous nature of the pastoralists and high birth rate.

4.3.4 Response on Level of Education

The respondents were asked their level of formal education and the response was analysed and summarized in Table 4.6.

Table 4.6 Educational Level of Respondents

Level of Education	Frequency	Percentage
None	144	55%
Primary	73	28%
Secondary	35	13%
College	11	4%
University	0	0%
Total	263	100%

Table 4.6 indicates that majority of the respondents 144(55%) have no formal education, while 73(28%) attended primary education, 35(13%) secondary education and 11(4%) attained professional training from college. There were none with university degree. This reflects that illiteracy rate is high among the pastoralists in the study area 144(55%) and that some of the pastoralist household heads that attained some level of formal education have preferred to remain in the mainstream pastoralist livelihood system of livestock herding other than urban life.

4.3.5 Response on Children Attending School

The study sought to find out the number of children from pastoralist households attending school and the findings was summarized and analysed in Table 4.7.

Table 4.7: Response on children attending school

Number of children	Frequency	Percentage
None	116	44%
1-3	98	37%
4-6	49	19%
Total	263	100%

Table 4.7 shows that 116 pastoralist households (44%) reported their children don't attend any formal education, while 98 households (37%) reported 1-3 children attend school and 49 households (19%) reported 4-6 children attend school. The findings reveal that frequent droughts and mushrooming of settlements in the area have compelled some pastoralist households to send their children to settlements where they stay with relatives during the drought and dry seasons and acquire opportunity to attend school. This trend tends to change during the wet and rainy seasons since some of the pastoralist households take their children back to the pastureland to help them in herding the livestock.

4.3.6 Response on Income

The study collected information on pastoralist households' main and alternative sources of income during drought seasons, which was analyzed and summarized in Tables 4.8 and 4.9.

Table 4.8: Main source of income

Main source of income	Frequency	Percentage
Herding livestock	155	59%
Commercial livestock trade	32	12%
Wage / salary	21	8%
Relief food	55	21%
Total	263	100%

Table 4.8 shows that 59% of the pastoralist's main source of income is the livestock they herd which indicates that majority of the rural population in Mandera West County is involved in live stock herding as their main source of livelihood. Commercial livestock trade accounts for 12% and there exists a significant 21% which is reliant on relief food distribution, an indication that the area was affected by drought and was receiving food aid. 8% of the respondents rely on wages earned by family members to support their livelihood.

Table 4.9: Alternative source of income

Alternative source of income	Frequency	Percentage
Seasonal farming	13	5%
Charcoal/material collection	55	21%
Petty trade	24	9%
Casual labour	18	7%
Rely on remittance	11	4%
Relief food	82	31%
Support from relatives	42	16%
Social security fund	18	7%
Total	263	100%

Table 4.9 indicates that relief food (31%) is the main alternative source of income for pastoralist households during drought and in severe dry seasons. Relief food is provided by government (national and county), aid agencies and charitable organizations in the area. This was followed by charcoal, fuel wood and building materials collections for sale representing 21%, which has environment ramifications leading to deforestation and looming desertification. Support from relatives accounts for 16% as an alternative income, indicating strong family and cultural bond among the pastoralists. The initial response adopted by pastoralists to cope with drought is seeking support from relatives in form of sharing milk

and borrowing of milking animals and they only seek external support and aid when the drought condition worsens.

4.4 Influence of Herd Management Strategies on Pastoralist Livelihood System

The study sought to examine the influence of herd management strategies on the livelihood system of pastoralists in Mandera West Sub County, Kenya. The study collected information on herd management practices adopted by pastoralists during drought.

4.4.1 Herd Diversification

Pastoralists practice herd diversification during the drought to minimize livestock losses and meet household needs. According to Fasil *et al* (2001) pastoralist herd diversification strategy is adopted to maintain variety of livestock species which are resistant to drought and are able to utilize the dry forage.

Pastoralist households were asked the types of species they preferred to keep during the drought and the findings was analyzed and summarized in Table 4.10.

Table 4.10: Herd diversification during the drought season

Species	Frequency	Percentage
Camel	62	24%
Cattle	50	19%
Goats	95	36%
Sheep	32	12%
Donkeys	24	9%
Total	263	100%

Table 4.10 shows that pastoralist households 95(36%) preferred to keep more of goats than other livestock species during the drought, which was followed by camel 62(24%). Cattle though not adoptable to drought stress were kept by pastoralist households 50(19%) during

drought especially at settlements where they were provided dry feed. Sheep was less preferred to goats as they are less adopted to browse in the dry season. Donkeys 24(9%) were significantly useful for short distance watering while camel were used for long distance water collection.

Camel and goats are more adoptable and resistant to drought than sheep and cattle which are more vulnerable to drought induced stress. Camels browse tall shrubs and are adaptive to dry conditions while cattle are grazers and suffer during drought due to grazing and water scarcity. In rainy seasons, pastoralist households keep larger ruminants, cattle and camels mainly for milk production and for sale. According to Aklilu (2001), smaller ruminants like goats and sheep are kept for meat and provide cash income to supplement household needs and have a short gestation period and rapidly multiply in rainy seasons.

4.4.2 Splitting of Herd

The respondents were asked whether they practiced splitting of the herd during the drought period and the finding was analyzed and summarized in Table 4.11.

Table 4.11: Splitting of the herd during the drought season

Splitting of herd	Frequency	Percentage
yes	160	61%
no	103	39%
Total	263	100%

Table 4.11 indicates that 61% of the respondents (160 households) practiced herd splitting in the previous drought season, where animals were split into dry, milking and weak animals and moved to suitable areas relating to their condition. The stronger but dry animals that could withstand long distances were moved to better distant grazing areas, while the milking and weak animals were moved closer to settlements where they were fed on dry fodder and

hay purchased from the local markets and sometimes provided by the government and NGOs as relief feed for weak livestock animals during the drought. 39% of the respondents (103 households) reported they kept the whole herd. These were mainly households with few livestock and those located on the periphery of urban centres and village settlements with water where relief food was distributed.

4.4.3 Sale of Animals

The study sought to find out the main reasons for sale of animals during the drought and the types of livestock species sold. The findings were analyzed and presented in Table 4.12.

Table 4.12: Sale of animals during the drought season

Purpose for selling	Type of livestock species							
	Camel		Cattle		Goats		Sheep	
	Freq	%	Freq	%	Freq	%	Freq	%
To improve herd	45	17%	42	16%	66	25%	42	16%
To purchase food	76	29%	47	18%	45	17%	47	18%
To pay for water	55	21%	11	4%	29	11%	51	19%
To purchase fodder	13	5%	29	11%	50	19%	18	7%
To dispose weak and sick animals	11	4%	110	42%	55	21%	76	29%
To support migration	63	24%	24	9%	18	7%	29	11%
Total	263	100%	263	100%	263	100%	263	100%

Table 4.12 shows that cattle (42%) and sheep (29%) were most affected by the drought and were disposed and sold to replace and diversify the herd with other drought resistant species. Camel which would fetch more money was sold to support drought demanding activities such as migration (24%), purchase of food (29%) and payment of water for the livestock and human use (21%). Goats which are more resistant to drought than cattle and sheep provided

household needs and cash income which would be used to purchase food (17%), to improve camel herd (25%) and as drought become severe some weak goats (25%) were sold. This indicates that the pastoralists practice livestock off take during the drought but are affected by low market prices during the drought.

This is in consistent with Rich and Wanyoike (2010) who have established that sale of livestock during the drought is a common drought management strategy among pastoralists. Access to markets allows the pastoralist households to sell livestock and livestock products and to purchase grains, medicines and other household needs.

4.5 Influence of Water Management Strategies on Pastoralist Livelihood System

The study sought to establish the influence of water management strategies on the livelihood system of pastoralists in Mandera West Sub County, Kenya. The respondents were asked to provide information on sources of water, compare availability of water during the drought and during rainy season and who was responsible for the management of the water source. The findings were analyzed and summarized in the following sections.

4.5.1 Water Source and Availability

Household respondents were asked to mention the water sources in their location and compare availability of water during the drought and rainy season. The findings were analysed and summarized in Tables 4.13 and 4.14.

Table 4.13: Water availability during the drought season

Water source	Water availability	Frequency	Percentage
Water pan	dry	0	0%
Water pond	dry	0	0%
Deep wells	available	5	2%
Shallow wells	available	11	4%
Drilled boreholes	available	150	57%
Hand pumps	available	5	2%
Underground water tanks (Berkat)	available	37	14%
Water trucking	available	55	21%
Total		263	100%

Table 4.13 shows 57% of the respondents (150 households) mentioned that pastoralists depended on boreholes as the main source of water during the drought. While 21% of the respondents (55 households) mentioned governments and aid agencies supplied water through water trucking for both animals and humans. Underground water tanks, commonly known as Berkat accounted for 14% (37 households) which contained water stored and reserved during the rains and in dry seasons when empty, water was supplied by water trucks.

Water availability and distance to the water source is the main factor constraining grazing in many dryland areas (Pratt 2010). Timely provision of water is very important water management strategy and reduces livestock mortality during the drought.

The finding is in consistent with Pratt (2010) and highlights the importance of herd mobility during the dry season. Pastoralists move their livestock to lowlands in dry seasons and use wells and boreholes to water their animals while livestock herders in the traditionally communal grazing areas water their animals from hand-dug shallow wells in the valleys.

Table 4.14: Water availability during the rainy season

Water source	Water availability	Frequency	Percentage
Water pan	available	82	31%
Water pond	available	68	26%
Deep wells	available	11	4%
Shallow wells	available	39	15%
Drilled boreholes	use is reduced	18	7%
Hand pumps	available	24	9%
Underground water tanks (Berkat)	reserved	5	2%
Rock water catchment	available	16	6%
Water trucking	not available	0	0%
Total		263	100%

Table 4.14 shows that that water pans (31%) and water ponds (26%) are the main source of water during the rainy season. Hand dug shallow wells (15%) provided water in the hilly rock catchment areas. Water trucking is not done during the rains and water collected in underground water tanks (2%) was reserved for use in the dry season. Pastoralists move to higher areas during the rains and utilize water in the pans and ponds and in dry season they move to low lands and valleys where water is available from boreholes and hand dug wells.

This findings is in consistent with Eileen (2005) findings that pastoralism as a livelihood system develops to get the most out of the opportunity provided by excess water and other natural resources in good seasons and accept to incur losses in low seasons. Pastoralists increase their livestock numbers in good seasons to maximize available resources and reduce the numbers to enough healthy stock that can sustain subsistence during the dry seasons.

4.5.2 Watering Distance

The respondents were asked to provide information on the frequency of watering their livestock during the drought and rainy season, the distance to the watering point and the number of hours it takes to reach the watering point from the grazing area. The findings were analyzed and summarized in Tables 4.15 and 4.16.

Table 4.15: Drinking frequency and distances to water points during the drought season

Livestock species	Drinking frequency	Distance to water point	Trekking hours
Camel	after every week	5-50 km	2-24 hrs
Cattle	after every 2 days	2-20 km	3-15 hrs
Goats	after every 3 days	2-15 km	2-10 hrs
Sheep	after every 3 days	2-15 km	2-10 hrs

Table 4.15 shows that in dry seasons livestock move to distant dry grazing lands which increases the frequency of drinking, distance to water points and the trekking hours. Camel which is more resistant to drought can graze from as far as 50 km and take a day's journey to trek to distant water points. Cattle are more susceptible to drought and trekking long hours extending to 15 hours makes them weak and in severe drought sometimes perishes before they reach the water points. The decrease in the frequency of dinking during the dry season is due to decrease in water availability and increase in watering distance.

Table 4.16: Drinking frequency and distances to water points during the rainy season

Livestock species	Drinking frequency	Distance to water point	Trekking hours
Camel	after every 2 days	2-10 km	1-7 hrs
Cattle	daily	2-5 km	0.5-5 hrs
Goats	daily	2-5 km	0.5-5 hrs
Sheep	daily	2-5 km	0.5-5 hrs

Table 4.16 provides an indication of increase in drinking frequency and reduction in watering distance which is attributed to increase in water availability and reduced watering distance. In rainy seasons their plenty of pasture and water and movement of the pastoralists herd is reduced. Camel grazing distance is significantly reduced during the rainy season from 50 km to 10 km and sometimes as low as 1-2 km from 5 km in the dry season. According to Omosa (2005), water is the determining factor for pastoralism to flourish and thrive and support sustainable pastoralist livelihood. Pastoralism relies on the availability of water, pastures and labour to ensure feasible and consistent viable livelihood.

4.5.3 Management of Water Source

The respondents were asked to indicate how the water sources were managed and who was responsible for their management, maintenance and rehabilitation. The finding was analyzed and summarized in Table 4.17.

Table 4.17: Management, maintenance and rehabilitation of the water source

Management of the water source	Frequency	Percentage
WUA	39	15%
Water department	84	32%
Chief	24	9%
NGO	63	24%
CBO	16	6%
Community	37	14%
Total	263	100%

Table 4.17 shows that the role of the pastoralist community was limited in the management of the water sources which accounted for 14% and that the establishment, maintenance and management of the water resources depended on support from government (32%) and NGOs (24%). Water user association were formed to transfer the management of the water sources to the community but are restrained as they lack both technical and resource capacity to manage and rehabilitate the water facilities and catchment area. Despite the lack of capacity WUAs manage 15% of the water sources especially operation of the boreholes. The management of water resources by chiefs has reduced to 9% as more responsibility is transferred to community structures which are formed, trained and empowered to manage the water sources.

4.6 Influence of Grazing Management Strategies on Pastoralist Livelihood System

The study sought to assess the influence of grazing management strategies on the livelihood system of pastoralists in Mandera West Sub County, Kenya. The study sought to find out the influence of grazing distance, availability of pasture and management of grazing land on the

livelihood system of pastoralists in the study area. The study sought to collect information on the distances of grazing, the vegetation type and how the grazing land was managed.

4.6.1 Grazing Distance

According to Blench (2000), a key feature of pastoralism is the ability of pastoralists to move their livestock herds to distant grazing areas along traditional migration routes and across international borders. Mobility is a survival strategy employed by pastoralists to utilize scarce grass and browse available during dry and drought seasons. The respondents were asked to provide information on grazing distances during drought and rainy seasons and the findings were analyzed and summarized in Tables 4.18 and 4.19.

Table 4.18: Grazing distance during drought season

Grazing distance	Frequency	Percentage
0-5km	18	7%
6-10km	30	11%
11-20km	39	15%
21-40km	74	28%
41 and above	102	39%
Total	263	100%

Table 4.18 shows that during dry and drought seasons grazing distance increased. Far grazing distance of more than 41 km was the highest (39%), followed by 21-40 km which represented 28%. grazing distance of 11-20 km accounted for 15% and shorter grazing distances of 0-5 km and 6-10 km were relatively less with 7% and 11%, which was due to lack of pasture in the shorter distances.

Table 4.19: Grazing distance during rainy season

Grazing distance	Frequency	Percentage
0-5km	47	18%
6-10km	55	21%
11-20km	103	39%
21-40km	42	16%
41 and above	16	6%
Total	263	100%

Table 4.19 shows that during the rainy season grazing distance reduced due to improved pasture in the lower grazing areas which have plenty of water and the trend changes during the dry season where the livestock herd moves to higher areas which have plenty of pasture but suffer water scarcity. Grazing distances of 11-20 km was the highest with 39% and movement of livestock was further in shorter distances of 6-10 km and 0-5 km which recorded 21% and 18% respectively. This is consistent with Kivaria (2006) that distances to grazing sites increase during the drought, from an average of 5.5 km pre-drought to 20.4 km, with pure pastoralists trekking even greater distances.

4.6.2 Availability of Pasture and Livestock Feed

The respondents were asked to indicate the vegetation type and its availability during the drought season. The findings was analysed and summarized in Tables 4.20.

Table 4.20: Availability of pasture, browse and livestock feed during the drought season

Type of vegetation and livestock feed	Availability of pasture and livestock feed	Frequency	Percentage
wet grass	available	0	0%
dry grass	available	42	16%
thorny shrub	available	82	31%
evergreen shrub	scarce	29	11%
acacia pods	available	24	9%
whole maize (relief food or purchased)	available	45	17%
hay	scarce	37	14%
fodder	scarce	5	2%
Total		263	100%

Table 4.20 indicates that thorny shrubs (31%) provide the bulk of forage during the dry season which devoid of wet succulent grass. Dry grass (16%) is available but far from water points which increases watering distance. During the drought hay supplement is provided by aid agencies and government department as drought relief livestock feed and this accounts for 14% available livestock feed during the drought.

The finding was in consistent with the findings of Orindi (2005) that stated pastoralists utilized different grazing areas in the wet and dry seasons through livestock mobility and that where the transhumance system was well managed it reduced overgrazing in grazing land.

4.6.3 Management of Grazing Land

The respondents were asked to indicate the role played various stakeholders in their area in the management of the grazing land. Grazing land in Mandera West is characterized as

communal grazing land, which is trust land and the pastoralist community have access to utilize the resources of the communal grazing the land. The study sought to find out the influence of grazing management on pastoralists' livelihood and the role of the pastoralists in the management of their pasture land.

The respondents were asked to provide information on how the grazing land was managed and who was responsible for the management. The findings was analyzed and summarized in Table 4.21.

Table 4.21: Management of the pastoral grazing land

Management of grazing land	Frequency	Percentage
Pastoral Association	11	4%
County department of livestock development	71	28%
Department of range management	109	43%
Chief	49	19%
NGO	0	0%
CBO	0	0%
Community	14	6%
Total	254	100%

Table 4.21 shows less community participation in the management of the grazing land which represented 6% and the highest were government departments responsible for livestock development and range management which was 28% and 43% respectively. Chiefs played an important role in the management of the grazing areas and have administrative powers to arrest those accused of destroying the environment and pasture lands. Non-governmental and community based organizations were not directly involved in the management of the grazing lands but contributed to the development of the natural resources.

4.7 Influence of Migration Strategies on Pastoralist Livelihood System

The study sought to determine the influence of migration strategies on the livelihood system of pastoralists in Mandera West Sub County, Kenya. Respondents were asked to indicate the frequency of migration, migration distance and migration length during drought season and the information collected was analysed and summarized in the following sections.

4.7.1 Frequency of Migration during Drought Season

The respondents were asked to indicate the frequency of migration in three distinct migration areas commonly used by pastoralists in the dry and drought seasons. The finding was analyzed and summarized in Table 4.22.

Table 4.22: Frequency of migration during the drought season

Migration area	Frequency	Percentage
Traditional grazing area	87	33%
Neighbouring districts/counties	55	21%
Across border into the neighbouring country	121	46%
Total	263	100%

Table 4.22 highlights migration is an important drought coping strategy adopted by pastoralists. 46% of the respondents (121 households) considered migration during the drought within their traditional grazing area where they moved with their herds to relatively dry but better pastures and 33% of the respondents (87 households) preferred migration across the border into the mountainous region of Southern Ethiopia. Herd mobility is an adoptive survival strategy practiced by pastoralists during dry and drought seasons. Migration to the neighbouring district and counties was lowest with 21% of the respondents (55 households) due to inter district conflicts between various pastoralist tribes and clans.

According to Blench (2000), pastoralists deal with these fluctuations by moving their herds to areas of higher precipitation or to drought-time grazing reserves and the greater their flexibility and ability to migrate the more they are able to survive drought.

4.7.2 Migration Distance

The respondents were asked to indicate the migration distance covered in search of pasture and water during dry and drought seasons. The finding was analyzed and summarized in Table 4.23.

Table 4.23 Migration distance during the drought season

Migration distance	Frequency	Percentage
10-20 km	42	16%
21-50 km	71	27%
51-70 km	82	31%
71-90 km	55	21%
91 and above	13	5%
Total	263	100%

Table 4.23 shows that majority of pastoralist in the area migrated to far distant areas outside their traditional grazing areas. This indicates that the drought condition was severe. 31%, 21% and 5% of the pastoralists' households migrated to 71-90 km, 51-90 km and 91 and above km respectively away from their traditional grazing area into southern Ethiopia. While 16% and 27% of the pastoralists' households migrated to 10-20 km and 21-50 km respectively, this was within their traditional grazing areas and the nearby neighbouring counties.

4.7.3 Migration Length

The respondents were asked to indicate the migration length in terms of time pastoralist stay in the area their migrated to during dry and drought seasons. The finding was analyzed and summarized in Table 4.24.

Table 4.24 Migration length during the drought season

Migration length	Frequency	Percentage
1-2 months	42	16%
3-4 months	63	24%
5-6 months	55	21%
7-8 months	47	18%
9-10 months	32	12%
11-12 months	24	9%
Total	263	100%

Table 4.24 shows that the longest migration length was 3-4 and 5-6 months which represented 24% and 21% respectively. This indicates that the migration length is consistent with the seasonal dry periods in the arid lands which is on average 4 months of dry season between two rainy seasons in the year.

The findings are in consistent with Blench (2000) that migrations and movements by pastoralists in search of water and forage for their livestock is an inherent strategy for survival as drought intensifies. Migration length is determined by the length of the dry season when pastoralists are vulnerable to the adverse climatic conditions and the influence of droughts whose frequency is rising with increasing global warming and climate change.

4.8 Key Informants View

Key informants were provided discussion sessions using interview guides comprising of question related to drought phenomena, the influence of drought management and drought mitigation and response. The findings were analysed and incorporated into the research report. The following categories of key informants shown in Table 4.25 participated in the interview and discussion sessions.

Table 4.25: Category of key informants interviewed

Category	Planned Sample size	Actual number interviewed	Percentage
Community Leaders	9	6	67%
Sub-County Representatives	6	3	50%
Sub-County Government Staff	5	2	40%
National Government Staff	8	2	25%
NDMA Staff	2	2	100%
NGO Staff	6	4	67%
Total	36	19	53%

The key informants were in agreement that the drought occurs frequently and pastoralists are constantly on the move which affects the livestock productivity and hence affects the livelihood of the pastoralists in the areas. Drought mitigation and response interventions are implemented by relevant government authority NDMA, formerly known as ALRMP and government departments which represented 56%, followed by aid organizations 37% and community participation was rated at 7% but community contribution also included establishment of community implementation committees and mobilization of community members that provided locally available resources and labour for response and recovery

programmes. The community participation may be higher since their contribution and support in drought interventions are normally not documented and recorded.

This is in consistent with Hesse and Odhiambo (2002) who have stated that vulnerability to frequent droughts in pastoral areas can be reduced through harmonization of pastoralist practices and national policies paying attention in particular to pastoral representation and involvement in the policy planning and formulation processes. Inappropriate government policies and development interventions in pastoral areas have increased poverty and vulnerability and have undermined pastoral systems and strategies for responding to drought and environmental stresses. In particular creation of settlements and concentration of water points in dry grazing areas have led to desertification and disruption of pastoralists' migration routes.

SUMMARY OF THE FINDINGS, DISCUSSIONS, CONCLUSIONS AND RECOMMENDATIONS

5.1 Introduction

This chapter presents a summary of findings with corresponding discussions of the findings. The conclusion of the study has been covered in accordance to the research questions generated at the beginning of the study. The chapter has also offered possible recommendations and suggestions for further research. The study was guided by the following objectives:

1. To examine the influence of herd management strategies on the livelihood system of pastoralists in Mandera West Sub County, Kenya.
2. To establish the influence of water management strategies on the livelihood system of pastoralists in Mandera West Sub County, Kenya.
3. To assess the influence of grazing management strategies on the livelihood system of pastoralists in Mandera West Sub County, Kenya.
4. To determine the influence of migration strategies on the livelihood system of pastoralists in Mandera West Sub County, Kenya.

5.2 Summary of Findings

From the data analyzed, it was evident that existing indigenous drought management strategy have impact on the livelihood system of pastoralists and that pastoralists adopt survival strategies in all stages of the drought management cycle. The analysis revealed that pastoralists are able to determine herd control measures from the onset of the drought season to when it becomes more severe.

The study looked at four key indigenous drought management strategies also referred to as coping strategies, which pastoralists adopt to survive long and severe drought conditions, and remain in the main stream pastoralism livelihood system. The study shows that 59% of the pastoralist's main source of income in Mandera Sub County is livestock herding and that livestock has the potential to support the county's economy. The study shows that commercial livestock trade is on the increase and accounts for 12% of the household income. This forms an employment and economic opportunity which the county can exploit to promote livestock productivity and create employment.

The study revealed that pastoralists adopted herd diversification in preparation for droughts and pastoralists improved their herd through drought resistant livestock species and that herd was diversified by increasing 36% of goats and 24% camel and replaced cattle and sheep which were more vulnerable to the drought. 61% of the pastoralists in Mandera Sub County practiced herd splitting during the drought season, where animals were split into strong, dry, milking and weak animals. The dry herd was moved to distant grazing areas away from their traditional grazing land and milking and weak animals moved near settlements where water, dry forage and hay was available from the local market.

The study revealed that herd mobility is an adoptive survival strategy practiced by pastoralists during dry and drought seasons. 39% of pastoralists moved with their livestock to far pasture areas which were more than 40 km away during dry and drought seasons. The study has highlighted that migration is an important drought coping strategy adopted by pastoralists. 46% of the respondents considered migration during the drought within their traditional grazing area where they moved with their herds to relatively dry but better pastures and 33% migrated across the border into the mountainous region of Southern Ethiopia.

The study indicates that majority of pastoralists are illiterate and that 55% of the pastoralist households have not had an opportunity to attend any formal education. The trend seems to be changing slowly as more children from pastoralist households are attending schools in settlements along the grazing routes. 37% of pastoralist households reported 1-3 children are attending school while 19% reported 4-6 children are attending school.

The study has revealed that despite the drought been more frequent, the area has adequate vegetation cover and that during dry seasons thorny shrubs provide 31% of the bulk of forage and 16% of dry grass is available though far from the water points which has increased watering distance and increased associated stress for the livestock and the herders. Purchase of hay is on the increase and accounts for 14% of available livestock feed during the drought.

The aim of the which was to establish the influence of existing indigenous drought management strategies on the livelihood system of pastoralists, revealed that pastoralists in Mandera West Sub County adopted indigenous drought management strategies which have improved and strengthened their resilience to the frequent droughts experienced in the area.

5.3 Conclusions

The study explored to establish the influence of indigenous drought management strategies on pastoralist livelihood system in Mandera West Sub County study concludes that effective indigenous drought management strategies are practiced and adopted by pastoralists in the area. These strategies have increased the survival of pastoralists and their livestock herd and have increased their resilience to drought. Different strategies are adopted in response to drought conditions and the study has established that herd diversification and timely migrations contributed most to the survival rate of livestock. Water and pasture scarcity during the drought has adverse effects on the survival of livestock during the drought and pastoralist households have to make timely decisions on when and where to move the

livestock. Pastoralist households determine when it is best to migrate and have established surveillance and traditional early warning systems that help them in appropriate decision making.

The findings of this study revealed that pastoralists in Mandera West sub county are homogenous, consisting of related tribes and clans, which has reduced inter and intra clan conflicts and has helped in resources conservation and utilization. The study has also established that pastoralism is the main livelihood system in Mandera West Sub County and more than 90% of the rural population is involved in livestock herding.

5.4 Recommendations for Policy Action

Based on the findings of the study, the following recommendations were suggested:-

1. The national and county government should support and implement livestock off-take during the drought to reduce vulnerability, to ensure pastoralist herders save livestock from perishing in the drought and to protect them from being exploited through low prices. Timely off take of livestock on the onset of droughts provides income required by pastoralists to facilitate migration and meet their household needs.
2. Concentration of water facilities in close proximity to grazing lands is causing degradation of the pasture land. Stakeholders involved in water development, spearheaded by the county government need to exploit establishing new water points and facilities across the grazing land, especially underground water to increase water availability and reduce overgrazing.
3. There is need for policy change to increase pastoralist communities' participation and decision making in resource conservation and protection. The current national policies relevant to pastoralist development are top-down. Some of these policies are the Strategy for the Revitalization of Agriculture (SRA 2004); National Livestock Policy (2008); Food

Security and Nutrition Policy (2011); ASAL development Policy (2010); and National Disaster Policy (2010). Pastoralists and their representatives have to be consulted and involved in the planning, formulation and implementation of programmes that affect their life and livelihood.

5.5 Suggestions for Further Studies

There is need to further study the changing phases of pastoralism as a livelihood system among pastoralists in northern Kenya. Pastoralism which is associated to organized and systematic movement of livestock along established migratory patterns in search of pasture and water is slowly and painstakingly getting confined to few patches of grazing areas faced with limited movements due to increasing settlements, conflicts and increased levies for water and access services. The effects of climate change causing droughts in pastoralist areas have been further compounded with conflicts, administrative and political settlements and reduced grazing land.

The following recommendations are suggested for purpose of further research:-

1. There is need to study and understand the role of literate pastoralists that have remained in the mainstream pastoralism livelihood system in pastoralist areas in the northern parts of Kenya.
2. There is need to study how herd diversification can be promoted to mitigate the effects of drought and ways of enhancing livestock marketing information and market outlets for pastoralists livestock from the onset to the peak of the drought in the pastoralist areas in northern region of Kenya.
3. There is need to further study and understand the effects of settlements on the migratory routes of pastoralists in northern region of Kenya.

4. There is need to further examine the impact of increased livestock population on grazing and water resources in the pastoralist areas in northern region of Kenya.
5. There is need for further study on the viability of commercial livestock herding as a economic enterprise and its linkage to local and international livestock market supply chain.

5.6 Contribution to the Body of Knowledge

This study has produced vital ideas that have contributed new knowledge towards sustainable development of pastoralism livelihood system in arid and semi arid lands in Kenya. Table 2.23 shows the contributions made by this study to the body of knowledge.

Table 23: Contribution to the body of knowledge

Objective	Contribution to the Body of Knowledge
1. To examine the influence of herd management strategies on the livelihood system of pastoralists in Mandera West Sub County, Kenya.	The study established that herd diversification is most appropriate survival drought strategy adopted by pastoralist herders in Mandera West Sub County in Kenya
2. To establish the influence of water management strategies on the livelihood system of pastoralists in Mandera West Sub County, Kenya.	The study established that watering distance and length increased as drought intensified. Pastoralists have no ownership right of the grazing land but utilize the natural resource which has led to low motivation in the conservation and management of the natural resources.

3. To assess the influence of grazing management strategies on the livelihood system of pastoralists in Mandera West Sub County, Kenya. The study established that the development of the pastoralists grazing lands is the responsibility of the national and county governments and that their need to involve pastoralists in the conservation and protection of the grazing lands.
4. To determine the influence of migration strategies on the livelihood system of pastoralists in Mandera West Sub County, Kenya. The study established that migration increased conflicts among pastoralists as they compete over scarce resources and therefore their need to build peace initiative and strengthen the capacity of pastoralist leaders in peace building and conflict resolutions.
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APPENDICES

Appendix 1: Letter of Transmittal

Mohamed Uwes Hussein
University of Nairobi
P.O Box 2177-20100
NAKURU, KENYA

5th May 2015

TO WHOM IT MAY CONCERN

Dear Sir/Madam,

RE: RESEARCH DATA COLLECTION PROCESS

My name is Mohamed Uwes Hussein, a graduate student at the University of Nairobi. I am undertaking studies in Masters of Arts in Planning and management and it is the requirement of the University graduate programme for students to engage in a field research in their area of interest and produce a thesis or research report.

I am conducting a research study on the influence of indigenous drought management strategies on the livelihood system of pastoralists in Mandera West Sub County in Kenya. I promise and assure you that the information collected in this research exercise will be strictly used only for academic purposes and that the identity and opinion of the respondents shall be confidential and respected.

I would like to kindly request you to participate in this study to enable collection of information required for the research data collection and analysis process. Confidentiality and anonymity of the individuals, organizations and community groups that participate in the research will be maintained. The information gathered will be strictly used for the purpose of this study only.

Thanks.

Yours faithfully

Mohamed Uwes Hussein

Reg. No. L50/84412/2012

Appendix 2: Letter of Introduction



UNIVERSITY OF NAIROBI
COLLEGE OF EDUCATION AND EXTERNAL STUDIES
SCHOOL OF CONTINUING AND DISTANCE EDUCATION
DEPARTMENT OF EXTRA - MURAL STUDIES

Tel 051 - 2210863

P. O Box 1120, Nakuru
16th April 2015

Our Ref: UoN/CEES/NKUEMC/1/12

To whom it may concern:

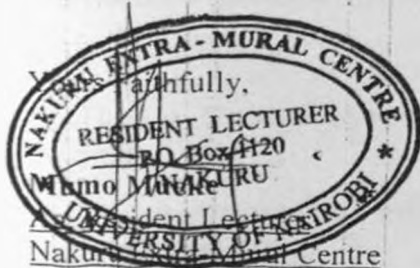
RE: HUSSEIN MOHAMED UWES – L50/84412/2012

The above named is a student of the University of Nairobi at Nakuru Extra-Mural Centre Pursuing a Masters degree in Project Planning and Management.

Part of the course requirement is that students must undertake a research project during their course of study. He has now been released to undertake the same and has identified your institution for the purpose of data collection on “Effects of Drought Management Strategies on Livelihood System of Pastoralists in Mandera West Sub County. Kenya.”

The information obtained will strictly be used for the purpose of the study.

I am for that reason writing to request that you please assist him.



Appendix 3: Research Authorization Letter



NATIONAL COMMISSION FOR SCIENCE, TECHNOLOGY AND INNOVATION

Telephone: +254-20-2213471,
2241349, 310571, 2219420
Fax: +254-20-318245, 318249
Email: secretary@nacosti.go.ke
Website: www.nacosti.go.ke
When replying please quote

9th Floor, Utahr House
Uhuru Highway
P.O. Box 30623-00100
NAIROBI-KENYA

Ref. No.

Date:

5th May, 2015

NACOSTI/P/15/6478/5942

Mohamed Uwes Hussein
University of Nairobi
P.O. Box 30197-00100
NAIROBI.

RE: RESEARCH AUTHORIZATION

Following your application for authority to carry out research on "*Effects of drought management strategies on the livelihood system of pastoralists in Mandera West Sub County, Kenya*" I am pleased to inform you that you have been authorized to undertake research in Mandera County for a period ending 30th September, 2015.

You are advised to report to the County Commissioner and the County Director of Education, Mandera County before embarking on the research project.

On completion of the research, you are required to submit two hard copies and one soft copy in pdf of the research report/thesis to our office.


DR. S. K. LANGAT, OGW
FOR: DIRECTOR-GENERAL/CEO

Copy to:

The County Commissioner
Mandera County.

The County Director of Education
Mandera County.

Appendix 4: Questionnaire for Household Survey

Questionnaire Number	
Location	

Section 1: Demographic characteristics

1. Sex of Respondent	Male
	Female
2. Age of Respondent	Below 25
	25-35
	36-45
	Above 45
3. Household size	1-3
	4-7
	8-15
4. Level of education	None
	Primary
	Secondary
	College
	University
5. Number of children attending school	None
	1-3
	4-6
	7-9
	Girls
6. Household's main source of income	Herding livestock

	Commercial livestock trade
	Wage / salary
	Relief food
	rely on remittance
	support from relatives
	others (specify)
7. Household's alternative source of income	Seasonal farming
	Charcoal/material collection
	Petty trade
	Casual labour
	Rely on remittance
	Relief food
	Support from relatives
	Social security fund
	others (specify)

Section 2: Herd management strategies

1. What type of livestock do you keep	Camel
	Cattle
	Goats
	Sheep
	Donkeys
	others (specify)
2. What was your average livestock size in the last 5 years	Camel
	Cattle
	Goats

	Sheep
	Donkeys
	others (specify)
3. Has your livestock size increased in the last 5 years	Yes
	No
4. What are the major constraints to sustaining your livelihood	conflicts
	drought
	floods
	livestock diseases
	human diseases
	lack of labour
	others (specify)
6. What are the main problems you face in keeping livestock	high tax
	shortage of water
	long distance grazing
	recurrent droughts
	livestock rustling
	conflicts
	others (specify)
7. What are the measures you adopt to reduce this problems	sale of weak animals
	migration in search of pasture and water
	herd diversification
	relief food
	splitting of herd

	purchase water
	purchase livestock feed
	others (specify)
8. Do you split the herd during drought and in severe dry seasons	yes
	no
9. Which livestock species do you prefer to keep during drought	Camel
	Cattle
	Goats
	Sheep
	Donkeys
	others (specify)
10. Did you sell animals in the last drought period	yes
	no
11. How many animals did you sell last year	Camels
	Cattle - Bulls
	Cattle - Cows
	Sheep
	Goats
	Camel
	Donkeys
12. Which season did you sell the animals	rainy season
	dry season
	drought

	others (specify)
13. Why did you sell the animals	to improve herd
	to purchase food
	to pay for water
	to purchase fodder
	to dispose weak dying animals
	to support migration
	others (specify)

Section 3: Water management strategies

1. What is the main source of water for livestock	river
	borehole
	shallow well
	water dam
	underground water tank (Berkat)
	others (specify)
2. What is the average watering distance to the nearest water source	0-2 km
	3-5 km
	6-10 km
	more than 10 km
3. Has water shortage been consistent in the last 5 years	Yes
	No
4. Who owns the water source in your traditional grazing area	Individuals
	Community
	Group
	Pastoralist Association

	others (specify)
5. How do you contribute to the management of the water source in your area	pay fee
	provide labour
	contribute live animals
	no contribution
	others (specify)
6. How do you contribute to the management of the water source in the neighbouring area	pay fee
	provide labour
	contribute live animals
	no contribution
	others (specify)

Section 4: Grazing management strategies

1. What is the average grazing distance during the wet season	0-5 km
	6-10 km
	11-20 km
	more than 20 km
2. What is the average grazing distance during the dry season	20-30
	31-50
	51-100
	more than 100 km
3. What are the difficulties you face in distant grazing areas	conflicts
	high levy for watering and grazing the animals
	loss of livestock

	others (specify)
4. Who manages the grazing land	None
	Traditional norms and structure
	Chief
	Clan elders
	ministry of livestock
	others (specify)

Section 5: Migration strategies

1. What is the average migration distance within your traditional grazing area	0-5 km
	6-10 km
	11-20 km
	more than 20 km
2. What is the average migration distance across border grazing area	20-30
	31-50
	51-100
	more than 100 km
3. How would you describe what drought means	failure of rains for several seasons
	lack of water and pasture
	Livestock weak and dying
	very hot and dry season
	others (specify)
4. What are the effects of drought	Drying of water sources
	Depletion of pasture
	Famine

	Loss of livestock
	Poor health of humans
	Poor health of animals
	Increase in food prices
	Decline in livestock prices
	others (specify)

Appendix 5: Interview Schedule Guide for Key Informants

1. How often does drought occur in Mandera West Sub County?
2. In the last ten years, how often has drought occurred in this area?
3. What is your understanding of drought?
4. What causes drought?
5. What are the main livelihood systems among people living in Mandera West Sub County, Kenya
6. How does drought affect this different livelihood groups?
7. What are the impacts of drought on:-
 - a) Livestock population
 - b) Livestock trade
 - c) Food security
 - d) Pastoralist community
 - e) Water management
 - f) Grazing management
 - g) Education
8. Does drought cause conflicts in the area?
9. How did the community cope with droughts in the past?
10. How does the community cope with the current and latest droughts?
11. What other livelihood options do people have in the event of severe drought?
12. What has the government done to help reduce the impacts of drought?
13. Are the drought intervention and response actions in the area timely and effective?
14. What in your opinion can be done to improve the livelihood system of pastoralists in the area?

Thanks for your cooperation and participation.

Appendix 6: Interview Guide for Government and NGO representatives

1. How has the recent drought events in Mandera West Sub County affected the livelihoods of pastoralists in the area?
2. What drought intervention and response measures are in place to address the effects of drought in the area?
3. Does drought cause conflicts in the area? How is conflict mitigated and reduced in the area?
4. Have pastoralist communities in the area been more vulnerable to the recent droughts in the past 5 years?
5. Which livelihood groups are most vulnerable to the recent droughts in the past 5 years?
6. Why are they most vulnerable?
7. How did pastoralist communities in the area cope with the recent droughts in the past 5 years?
8. Have more pastoralist households left the main pastoralist livelihood system and moved to settlement in the past 5 years?
9. What are the alternative livelihoods for pastoralist drop outs in the rural and urban settlements in the area?
10. What measures are in place at Sub County, County and National level to improve pastoralism as a livelihood in the area?

Thanks for your cooperation and participation.

Appendix 7: Map of Mandera West Sub County

