EFFECTS OF CLIMATE VARIABILITY ON THE LIVELIHOODS AND COPING STRATEGIES OF THE BORANA COMMUNITY IN ISIOLO COUNTY, NORTHERN KENYA

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DECLARATION

This thesis is my original work and has not been presented for a degree in any other University

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DEDICATION

To my late father,Stanslaus Kagunyu, and my mother, ScolasticaWambui, my husband Joseph Gatura, my children Stanslaus Kagunyu, Eunice Wameru andVincent Wanjohi for the sacrifices they made to make me achieve the best.

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ABSTRACT

This study was done to assess the effectsof climate variability on the livelihood and coping strategies of the Borana of Isiolo County. The study sought answers to the following research questions: What is the Borana understanding of climate variability? How hasclimate variability affected the livelihoods of the Borana in Isiolo County? How hasclimate variabilityaffected the community'scoping strategies? And, are there any adaptive strategies which would be more suitable for the community than others?

The overall objective of the study was to assess the effectsof climate variability on the livelihood and the coping strategies of the Borana of Isiolo County. The specific objectives were to establish the Borana peoples' understanding ofclimate variability; to examine the effectsof climate variability on the livelihoods of this community; to describe the effects ofclimate variability on the community's coping strategies; and to identify possible adaptive strategies that could minimize the adverse effects ofclimate variability on the livelihoods of the community.The study was guided by the cultural ecological and resilient theories, data were collected through secondary sources, semi-structured interviews, focus group discussions, key informant interviews and direct observation.

The findings indicate that the respondents are aware of climate variability. Which is associated with human activities, nature and God's doing. The study also showsthat climate variability has affected negatively the livelihoods of the Borana in various ways including the deaths of livestock, poverty, displacement, reduced food security, change in eating habits, house building styles, emergence of livestock andhumandiseases and changes in gender-based roles. The

findings also indicate that pastoral coping strategies have been weakened by recurrent droughts and floods. The study further shows that some adaptive strategies have been put in place by government departments, NGOs and faith-based organizations to mitigate the effects of climate variability in the study area.

The study concludes that climate variability has, in general, negatively affected the coping strategies of the Borana of Isiolo County. The study, therefore, recommends a combination of the existing indigenous early warning indicators with modern forecasting methods to make them more appropriate.The study also recommends that the government and other actors involved in the area should assist the community with more sustainable and effective intervention measures. Finally, there is a need for development agents to ensure full participation of the local communities in the conception, design and implementation of sustainable interventions to reverse the effects of climate variability in the County. For further research,the study recommends a study to document the number of Borana ex-pastoralists due to severe drought, the type of activities they engage in and the constraints they face in implementing their activities. The study also recommends that more research needs to be done concerning wild edible plants, their nutritional status and their mode of propagation.

LIST OF ACRONYMS AND ABBREVIATIONS

AfDB	African Development Bank
AIDS	Acquired Immunodeficiency Syndrome
ASALs	Arid and Semi-Arid Lands
CBPP	Contagious bovine pleuropneumonia
CCPP	Contagious caprine pleuropneumonia
DFID	Department for International Development
FAO	Food and Agriculture Organisation
GoK	Government of Kenya
GoT	Government of Tanzania
GoU	Government of Uganda
HIV	Human Immunodeficiency Virus
IPCC	Intergovernmental Panel on Climate Change
KARI	Kenya Agricultural Research Institute
NGO	Non-governmental Organisation
NOAA	National Oceanic and Atmospheric Administration
LEWS	Livestock early warning system
RVF	Rift Valley Fever
TB	Tuberculosis
UNFCCC	United Nations Framework Convention on Climate Change
UNEP	United Nations Environment Programme
WFP	World Food Programme
WHO	World Health Organisation

CHAPTER ONE

BACKGROUND TO THE STUDY

1.1 Introduction

This study examined the effectsof climate variability on the livelihoods and the coping strategies of the Borana pastoral community of Isiolo County, Northern Kenya. Climate variability is an indicator of global climate change, which has been brought about directly or indirectly by human activities that alter the composition of the global atmosphere.It is now widely accepted that there is climate change all over the world. For example, the global mean temperature increased by 0.6° C in the last century and the 1990s were particularly hot years (IPCC, 2002:101). The impact of global climate variability includes increased intensity and frequency of storms, as well as alteration of rainfall amounts and patterns. Other factors include altered hydrological cycles, rising temperatures, persistent droughts and flooding (Kitiem et al., 2008:1). Evidence of increasing climatic instability in East Africa manifests itself in more frequent and intense weather extremes. For example, in Uganda an analysis of the temperature records shows a sustained warming, particularly over the southern parts of the country with the minimum temperature rising faster than the maximum temperature (GoU, 2002). The disappearance of the snow caps on Mount Kilimanjaro and the Ruwenzori peaks provides strong evidence of the warming trend in East Africa. Kenya has suffered a series of droughts and floods of varying magnitudes, duration, and spatial extent, with diverse consequences that have had devastating socio-economic and environmental consequences, indicating climate change (Serigne and Verchot, 2006:10).

Geographical location is a key factor in defining who is more exposed to climate variability than others (Serigne and Verchot, 2006: 9). Many areas of East Africa are prone to climate variability; the arid and semi-arid lands (ASALs) are by far the most vulnerable (Serigne and Verchot, 2006: 14)**.**Carlos (2003:2) has described ASALs as hot dry lands with limited and erratic rainfall patterns and with an evapo-transpiration rate of more than twice the available rainfall. In the very arid lands, annual rainfall is below 350 mm, while in the arid areas it is between 350 mm and 550 mm. These conditions make the ASALs particularly vulnerable to the negative impacts of climate change, especially in relation to food and livelihood security. According to Kaitho et al. (2006:1), there has been a change in drought occurrence in Kenya as it used to occur in ten years but currently it is occurring after 3 years and sometimes after one year. This means that ASAL livelihood systems do not adequately recover to withstand the next drought. As a result, any small shock such as a prolonged dry spell has a much bigger impact on people's livelihood strategies than in the past. This situation is aggravated by insecurity, rising poverty and declining asset levels (natural, human, social, financial and physical assets).

Climate variability is a serious global threat which demands an urgent global response since it causes droughts and floods. It already affects the basic needs of people around the world. These needs include access to water, food and livestock production, health and the environment. According to Serigne and Verchot (2006: 14) the most vulnerable people suffer the earliest and most, even though they have contributed least to the causes of climate change. Severe droughts which have been connected to climate variation has caused massive losses to pastoralists in the northern parts of Kenya, as they are exposed to extreme droughts that have led to soil erosion and the drying of water pans (Mboya, 2008:2). Repeated occurrence of droughts and a high

variability of precipitations have made it difficult for the pastoral communities in the ASALs to maintain their assets while lack of timely early warning information has reduced their capacity to respond when the conditions are still good. One peculiar aspect of climate change is that, in many instances, it will render dry areas even drier and wet areas wetter and any of these two outcomes will have serious implications for the communities and the environment. An increased frequency and intensity of climatic extremes such as droughts and floods will be an even bigger challenge in the future. The effect of climate change has seen an increasing number of families lose their entire herds to droughts, forcing them to settle for relief food or become hunters and gatherers. This has led to the mushrooming of feeding centres, while human activities pillage the fragile range biomass in the surrounding environment, leading to open vast plains characterised by dust and storms (Mboya, 2008:2).

Drought is the major climatic hazard affecting agriculture and livelihoods in rural Kenya. It ranks first among naturals hazards in the number of persons affected in Kenya and Africa (UNDP/BCPR 2004: 3; UNEP 2002:1). According to the Gok (2002: 12) prolonged droughts affect the people living in Isiolo County and recurs very often. Drought has had a major devastating impact on the economy of the local community. For example, livestock die and this greatly affects the economy as cattle, Camels, Sheep and Goats are a major source of wealth in the community. Jillo et al. (2007:1) indicates that there has been losses of livestock over the last 40 years in Isiolo County leading to poverty. According to them over the last four decades the Borana pastoral system has undergone a tremendous socio-economic transformation. Which they attributed to droughts and shifter wars that killed large number of livestock and also led to land degradation that altered the composition of livestock, because of the persistent droughts that

occur in this region from time to time, food insecurity and epidemic diseases forboth human and livestock is common in Isiolo County(GoK 2005b:7). According to Doti (2009:189) climate change and pastoralists' livelihood are interlinked processes: pastoralists and their livestock depend directly or indirectly on the environment, hence threats from climate change, particularly persistent drought, have far reaching consequences for them. Climate variabilty affects the availability of water resources and forage for livestock, and long periods of drought have led to the loss of large numbers of livestock in most pastoral areas.

The Borana community of Isiolo Central Division who are the target in this study over the years, have developed mechanisms to cope with these droughts. They have a rich set of indigenous strategies and mechanisms that enabled them to deal with multiple threats, variability and environmental changes. Their mechanisms have helped them to survive and effectively use the harsh and highly variable environment. Some of these strategies are ecologically-based, while others depend upon socio-economic and cultural mechanisms (Eriksen, et al., 2008:16). However, of late drought hasbecome intense and occurrs more frequently than it used to. Communities have to deal with more uncertain weather, with extreme events occurring more frequently. Forecosystems in the rangelands, crop, forage and livestock production closely follow rainfall trends, thus putting the livelihoods of a number of households at risk.Therefore this study was initiated to examine the effects of drought on the livelihood and coping strategies of the Borana community of Isiolo County northern Kenya.

1.2 Pastoral communities of Isiolo

WISP (2011: 1)defines the term pastoralist as one who lives by keeping flocks of sheep or cattle. According to Field (2005:6) pastoral production systems are defined as those in which half or

more of the gross household income (that is, subsistence consumption plus marketed production from the family herds) comes from livestock or livestock related activities. Pastoralism is practised in areas where crop production has not been possible due to inadequate rainfall coupled with poor soils. The species of animals vary with the region of the world but they are all domesticated herbivores that normally live in herds and eat grasses or other abundant plant foods.

In Kenya pastoral communities occupy the arid and semi-arid lands (ASALs), where the rainfall is sparse, infrequent, un-reliable and often less than 500 mm annually. These areas are only suitable for livestock rearing, and the livestock population includes cattle, goats, camels, sheep, and poultry (Field, 2005: 13). According to Kariuki andLetitenya (1998:17) livestock production is the only suitable economic activity of those people who live in the arid and semi-arid rangelands. Livestock performs a wide variety of economic and social functions in pastoral communities and in the national economy. It generates food (meat, milk), cash income, clothing, employment and capital investment.

Pastoral communities are the major ethnic groups inhabiting Isiolo County and they include the Borana, Turkana, Somali, Samburu, Rendille Sakuye and Gabra. Other communities inhabiting the district are the Ameru who are agro-pastoralists, and government civil servants such as the Agikuyu, Luo, and Abaluyia. The Borana are a group of the Oromo people whose language belongs to the Cushitic sub-family which is common to most of north-eastern Africa (Coppock, 1994: 69). In their oral traditions the Borana state that they originally came from the Dire and Liban regions of southern Ethiopia (Were and Wanjala, 1986: 26). According to Makong'o

(2003:55) the Borana could have moved from southern Ethiopia to the northern Kenya areas in the last quarter of the 19th century and early 20th century during the reign of Menelik II. In Kenya the Borana community settled in Moyale, Marsabit, Isiolo, Garissa and River Tana (Godana 2011: 10). The Borana community of Kenya lives in a large area of barren northern Kenya.

1.3 Borana culture

In the Borana social system descent is traced through the patriarchal lineage (Coppock, 1994:70). The social system has a hierarchical structure having a nuclear family as the smallest unit referred to as the *ibidda*(Legesse, 1973:39).This is composed of a man with his wife or wives and children, and is followed by the extended family(*warra),*and lineages. Men are called *abba warra* or father of households. They make the strategic decisions regarding livestock production and sales (Coppock, 1994:70).

The Borana culture is also known for its traditional gada system, an indigenous and complex socio/political structure that governs the strategic interests of the Borana society. The gada system is believed to have evolved in the 1600s and it is based on a system that divides the Borana community into a number of general classes (Kamara, 2000:3). It is responsible for all issues affecting the pastoral life of the community, including governance of pastures, provision of a framework for socio-political stability and protection from external invasions (Kamara, 2000: 4). A new gada is elected after every eight years by an assembly of all the Borana people or their representatives (*gumi gayu*).The Borana derive their livelihood from pastoralism;they rear cattle, sheep, goats and donkeys (Kiruthu et al., 2003:81).Cattle are by far the most important livestock kept (Coppock, 1994: 150), while camels are reared to a lesser extent.Their

herds are not only for food but they are also vital for sacrifices and rituals to guarantee fertility,health and they also serve as the main sources of wealth and legal fines.

Climate variability has led to recurrent droughts in the past. However, a major drought was normally expected once every 10 years, although in the past three decades major droughts recurred after every 5-7 years (Kaitho et al., 2006:1). This means that the Borana livelihood systems do not adequately recover to withstand the next drought. As a result, any small shock such as a prolonged dry spell has a much bigger impact on people's livelihood strategies than in the past. This situation is aggravated by insecurity, rising poverty and declining asset levels (natural, human, social, financial and physical assets).

According to Langil and Dathi (2001:68), pastoral communities have a number of coping strategies which they use during times of droughts. They adopt two categories of drought management, that is, *ex-ante* and *ex-post* (Olukoye et al., 2001:59).*Ex-ante* is considered as a risk response while *ex-post* is viewed as a coping strategy. Some of the coping strategies applied by pastoral communities include movement with their livestock to other regions. According to Kagunyu et al. (2008: 2), pastoral communities move long distances along and across the borders to save themselves and their livestock. On its part,Oxfam GB (2008: 30) asserts that livestock mobility is the most important strategy that pastoral communities utilize to cope with the devastating effects of droughts. Herd diversification is a traditional coping mechanism used by the Borana to protect themselves against food insecurity and drought (Jillo 2006:4). According to Doti (2009:4) herd diversification is a basic strategy for wealth accumulation and risk management for the Borana. Herd diversification is made possible by the existence of productive, diverse rangelands that had a robust mixture of herbaceous and woody forage

species. This strategy sometimes iscombined withherd splitting which involvessplitting the herd into smaller groups and moving them to different areas. The strategy is used to prevent over-grazing and tomaintain the long-term productivity of the range.

According to Doti (2010: 4) herd maximization is another strategy used by the Borana community as a coping strategy against natural calamities such as droughts, floods and diseases. The Borana keep large herds of livestock which serve many functions such as a form of insurance, investment and a hedge against drought. Large herds increase the chances of livestock survival during droughts and when there are outbreak of diseases.Livestock feed supplementation which involves supplementation of livestock with other feeds is common during drought it is usually referred to as cut-and-carry (Oxfam GB 2008:30). Sharing, loaning, and gift-giving among pastoralists are year-round activities, forming an integral part of the communal way of life. However, sharing of assets intensifies during and after drought when those families hit hardest run short of milk or meat for consumption Oxfam GB (2008: 31).

Wild plant fruits and vegetables were occasionally used as food by the Borana during droughts and times of famine. Coppock (1994: 164) indicates that they collected wild foods such as roots, tubers, leaves and seeds. Other strategies applied include selling of livestock, slaughtering of small ruminants (goats and sheep), and relying on relief food. The coping strategies for pastoral communities are short-term and are only utilised to face a sudden unanticipated climatic risk. A study by Orindi et al. (2008:3),alsoshows that the range of coping strategies available to households is increasingly becoming smaller and ineffective.This study was conducted in Isiolo County and it focused on how climate variability has affected the Borana livelihoods and coping strategies. The Borana livelihoods studied included social well-being, environment, housing, alternative livelihoods sources of income, food security, livestock and human health, and the

gender division of roles. While coping strategies included movement to different areas, herd diversification, herd maximization, and use of emergency feeding strategies such as cut and carry and reliance on wild fruits and vegetables.

1.1 Problem statement

Climate variability is a natural phenomenon, and in the study area it is becoming more frequent and intensive. This is happening in a fragile ecosystem, meaning that its effects are moreserious in the area than in an area that is ecologically less fragile. While climate variability and change, particularly droughts strongly affect pastoralists and crop farmers, the negative impacts of climate variability are experienced more by the communities in the arid and semi-arid lands as their regions are characterized by low and unreliable rainfall (Orindi et al. 2008: 3). This has negative implications for fodder availability for pastoral production. Climate change introduces an additional uncertainty into existing vulnerabilities in the ASALs. For instance, in northern Kenya during the 1997-1998 *El Niño* rains, 80% of the livestock died (Serigne and Verchot, 2006:6). With increased fragility of the ASALs, it has become increasingly difficult for the livestock sector to sustain production to cope with increased demand for products. It is estimated that the annual growth rate of livestock production (value of animals) in Kenya declined from 3.5% in 1980-1990 to -1.3% in 1990-2000. The largest decline was in cattle (from 3.3% to -1.6%), while the growth rate of sheep and goat production declined from 4.0 to -0.7%. This had serious implications for the livelihoods of the people.

Natural disasters such as drought, floods, earth quakes and storms are not new to the arid and semi-arid areas.Traditionally, pastoralists have used indigenous coping strategies to address these disasters. They also have indigenous knowledge to understand the weather and climate patterns

and make decisions on what strategy to apply. Their coping mechanisms appear to have worked well since time in memorial. But to what extent this has been affected by severe and frequent droughts is not known. Despite the importance of pastoral livelihoods to the economy of Kenya there is very little or not enough information or study on the effects of climate variability on the livelihoods of the pastoralist communities and also on their coping strategies. Most studies focus on crop production in high potential areas.

Therefore, this study aimed at investigating the extent to which the pastoral livelihoods and coping strategies have been affected byclimate variability. In order to achieve this, the study sought to answer the following questions:

1. What is the Borana understanding of climate variability?
2. How has climate variability affected the livelihoods of the Borana in Isiolo County?
3. How has climate variability affected these people's coping strategies?
4. Are there any adaptive strategies which might be more suitable for the community than others?

1.5. Objectives of the study

1.5.1 Overall Objective

To asses the effects of climate variability on the coping strategies of the Borana of Isiolo County.

1.5.2 Specific objectives

1. To establish the Borana understanding of climate variability.
2. To examine the effect of climate variability on the livelihoods of this community.
3. To describe the effect of climate variability on the community's coping strategies.

4. To identify possible adaptive strategies that could minimize adverse effects of climate variability on the livelihoods of the community.

1. 6 Assumptions

The following assumptions were formulated for the study.

1. The Borana pastoralists of Isiolo County understand the concept of climate variability.
2. Climate variability has affected the livelihoods of community.
3. Climate variability has affected the coping strategies of the community.

1.7 Justification of the study

This study was conceived after the realization that climate variability is a reality and that it posed threats to pastoral communities living in the ASALs as well as their livelihoods and coping strategies.Lives and livelihoods can be saved if local communities and institutions were better prepared and responded quickly and adequately to the effects of drought. Therefore, this study is useful for several reasons. First, it provides information to policy makers on what was happening in ASAL regions of northern Kenya which are usually marginalized. It provides insights, evidence and information on the effects of climate variability onlivelihood and coping strategies of pastoral communities. This information could be crucial in assisting policy makers to make rational and informed decisions in allocating resources to mitigate the adverse effects ofclimate variability.

Secondly, the study provides information on appropriate adaptation strategies which could be applied to reduce the negative effects of climate variability. This information should assist policy

makers, donors and researchers in coming up with appropriate researches, innovations and development interventions that will improve the livelihoods of the pastoral communities.

Finally, current forecasting in terms of climate variability (rains, droughts, and floods), pests and disease outbreaks predominantly relies on conventional science ignoring that there exists a local knowledge system that can be tapped to improve the forecasting and, hence, have more realistic results that are more compatible with the realities on the ground. Therefore, the study should contribute to a more appropriate forecasting system by assisting policy makers in developing better policies and strategies that are affected by droughts such as Agriculture and Livestock Strategic Plans.

1.8 Scope of the study

The study was conducted in Isiolo County and focused on one livestock keeping community, the Borana. Although the issue investigated affected other areas of Kenya, the coverage of these other areas were not possible due to logistical problems.The findings of this study was generalized to other pastoral communities in the arid regions. The study focused on the effects of drought on these people's livelihoods and coping strategies. The study was guided by the cultural ecological theory and resilience theory. The study was Anthropological in approach and its emphasis was in the field ofdevelopment Anthropology.

1.9 Limitations of the study

One limitation of this study was scarcity of secondary data as some of the necessary records and publications were not available. This problem was solved by using online publications.

According to Mugenda and Mugenda (2003: 73), in open-ended questions respondents are free to give responses which are deemed to be proper but there is a tendency of them providing information which does not answer the questions. This was solved by repeating the questions to make them clearer to the respondents.

Another limitation of the study was memory recall especially for focus group participants. This limitation was addressed by selecting participants in the 45–60 year age category, as they could recall how climate patterns have been changing over the last 20 years.

1.10Operational definition of terms

Climate variability: Tendency of the weather conditions of a place to vary and this variation is indicated by extreme temperatures, droughts and rainfall patterns.

Drought: In this study it was defined as failure of rainfall for one successive rainy season.

Severe drought: It was defined as failure of rainfall for more than two consecutive seasons.

Prolonged drought: This study defined as drought that takes more than one year (duration).

Effects: In this study it was defined as negative results on the coping strategies of the Borana. These included deaths of livestock, shortages of forage, livestock raiding and conflicts, competition over natural resources and family breakdowns.

Livelihood: In this study it was defined as social well-being, environment, housing, alternative livelihoods sources of income, food security, livestock and human health, and the gender division of roles.

Coping strategy: A mechanism adopted by a household or community to respond to an unexpected event such as a drought or flood.

El Niño: It was defined as a climate pattern that describes the unusual warming of surface waters along the tropical west coast of South America.

Storms: It was defined as a violent disturbance of the atmosphere with strong winds and usually rain, thunder, lightning, or snow.

Normal rain: This was taken as the rain that comes at the expected time, that is, during the short and the long rainy seasons.

Shortage of rain: It was taken as having low rainfall than expected.

Livestock mobility: The migration made by pastoral communities with their livestock in search of pasture and water. The distance travelled could be near their settlement or very far, as they sometimes migrate to Ethiopia.

Herd maximization: An act of the pastoral communities which involves keeping big herds of livestock.

Cut and carry: An act of pastoral communities to search for supplementary feeds for livestock when there is a drought.

Adaptation: The ability of a system to adjust to climate change (including droughts and extremes) to moderate potential damages, to take advantage of opportunities, or to cope with theconsequences. It was measured by establishing the existing institutions which assist the Borana community and the type of assistance given.

Resilience: In this study it was defined as the ability of a system to remain functionally stable in the face of stress and to recover following a disturbance or the capacity to be flexible.

Occupation: This is the daily activity households engaged in.

CHAPTER TWO

LITERATURE REVIEW

2.1 Introduction

This chapter presents a review of the literature relating to the research problem. It focuses on climate variability, its causes and the general impact of Climate variability to pastoral livelihoods, its coping strategies and the role of external agents in assisting the pastoral communities. After the literature review, the theoretical framework that guided the study is discussed.

2.2.1 Climate variability

Climate is perhaps by far the single most important factor influencing land use and the ecological dynamics of an ecosystem (Keya, 2001:28). In northern Kenya the type of livestock kept, grazing patterns as well as the vegetation types and formations are to a large extent a function of the prevailing climatic conditions. The major determinants of the climate in this region are the low and erratic rainfall, high daytime temperatures and evapo-transpiration regimes, relatively high wind speeds and frequent droughts (Keya, 2001:29).

Climate variability refers to variations in the mean state and other statistics (such as standard deviationsand the occurrence of extremes) of the climate on all temporal and spatial scales beyond that of individual weather events. IPCC (2007:30) gives indicators of climate variability as extended droughts, floods, and conditions that result from periodic El Niño and La Niña events.NOAA (2010: 3) indicates that the climate of the earth is dynamic and naturally varies on seasonal, decadal, centennial, and longer timescales. Each "up and down" fluctuation leads to

conditions which are warmer or colder, wetter or drier, more stormy or quiescent. The climateof the world is clearly changing. According to Baird (2008:1) the warming of the climate system is unequivocal, as is now evident from observations of increases in global average air and ocean temperatures, widespread melting of the snow and ice and rising global average sea levels. In addition to these, relatively gradual changes, climate change also has sudden impacts in the form of more weather-related disasters.

Climate change is caused by emissions of greenhouse gases largely from energy production and consumption, agriculture and other ecological processes. The activities causing most emissions are key drivers of global socio-economic development. Thus, high-income countries are responsible for a large percentage of these emissions with the USA and Europe emitting 51 per cent of total greenhouse gases into the atmosphere compared to Africa's 2.5 per cent (Awour et al., 2008: 231). According to GOK (2010:4),climate change and variability is rapidly emerging as one of the most serious global problems affecting many sectors in the world and is considered to be one of the most serious threat to sustainable development with adverse impacts on the environment, human health, food security, economic activities, natural resource management and physical infrastructure.

According toApata and Adeola (2009:5),theAfrican continent is the most affected by adverse climate change. The expected impacts of climate change in Africa include: increase in droughts, floods, windstorms and other extreme climate phenomena, which will reduce fresh water availability, threaten food security and human health, diminish industrial production and weaken

the physical infrastructure base for socio-economic activity resulting in reduced development (Sergine and Verchot, 2006: 18).

Changes in rainfall, including a likely increase in rainfall in East Africa, and drying in South-east Africa, as well as more intense land use, will result in increased deforestation, loss of forest quality and woodlands and degradation across the continent that will worsen desertification. This will exert greater pressure on already strained coping strategies and will very likely result in increased poverty.In Kenya there are various indicators of climate variability which include erratic rainfall patterns, persistence droughts, and vanishing glaciers on Mt. Kenya (Kanywithia, 2010:5).

The areas in Kenya most affected by climate variability are the arid and semi-arid. Omosa (2005:7)states that these areas constitute 80% of Kenya's land mass and support 70% and 25% of the nation's livestock and human populations, respectively. These regions receive an annual rainfall of below 500mm and its distribution within the seasons is usually unpredictable.Livestock is the major economic activity of these ASALs. As climate change looms globally, extreme weather events have already impacted on the livelihoods of pastoralistin significant and uncertain ways. According to Sergine and Verchot (2006:9) pastoral communities living in the predominant arid and semi-arid Counties of Kenya are bearing the brunt of adverse consequences particularly food insecurity due to droughts, floods and livestock diseases.

2.2.2 Recent climatic trends

Kenya has also suffered a series of droughts and floods which have had devastating socio-economic and environmental consequences (Serigne and Verchot, 2006:10). Here is a chronology of the most recent events: In January 1997, the Kenya Government declared a state

of national disaster after a severe drought threatened the livelihoods of 2 million people. In 1997/98 there was heavy El Niño-induced rains, while 2000 witnessed a drought which was the worst in 37 years. Also in 2002 devastating floods hit many areas of the country leading to human deaths by drowning and landslides, loss of properties and displacement of people. In the year 2004 the long rains failed and the subsequent crop failures left more than 2.3 million people in need of assistance. Finally, in April 2005 the UN World Food Programme (WFP) estimated that up to 2 million Kenyans, most of them residents of arid or semi-arid regions, needed food assistance due to failed rains (Serigne and Verchot, 2006: 11).

2.2.3 Pastoralists' use of indigenous climate forecasting methods

Pastoral communities have for a long time used indigenous forecasting methods to predict seasonal climatic events (Winnie et al., 2002:22). However, many traditional forecasting methods are perceived as becoming less reliable with increasing climate variability. Some of the pastoral communities observe clouds, wind and lightning that likely have their origins in traditional understandings of what contemporary researchers recognize as atmospheric science. Others watch the behaviour of livestock, wildlife and the local flora. According to Kagunyu et al. (2008:11) the Gabra and Borana communities observe the intestines of slaughtered animals, the pattern of the stars while others interpret dreams. Most of the indigenous weather forecast gives details of the upcoming seasons, for instance, when the rain will start, where it will rain and when it will end. Ethno-meteorological methods have been poorly understood but nonetheless they may be based on intrinsically scientific foundations that account for moderate observed forecast skills.

The pastoral communities have relied on their indigenous early warning systems since time immemorial but with the recurrent droughts, which have led to enormous deaths of livestock, there is need a to integrate indigenous and modern early warning systems (Gatarwa and Kaitho, 2006: 2). External forecasts are situated in urban centres and the information is not quite clear to pastoral communities. The timing of the rain by pastoral communities is an important issue as it gives them the time when to migrate with their livestock to different areas. The challenge for the external forecasters is to demonstrate that they can contribute new, valuable information to pastoralists.

2.2.4 Information communication and climate variability

According to Mulenkei (2006:26) pastoral communities inhabit isolated areas and are unable to access information about climate variability and as this variability progresses they become more vulnerable. However, Gatarwa and Kaitho (2006:1) state that livestock information network and knowledge system (LINKS) has established systems to pass information to pastoral communities. LINKS is a new project which uses a short message system (sms) phone technology as well as internet technology to build on the early warning systems project. In 1997 the Global Livestock Collaborative Research Support Program established (GL-CRSP) Livestock early warning system (LEWS) which employs satellite weather monitoring technology to provide early warnings to those who could be affected by climatic conditions such as flooding and droughts (Gatarwa and Kaitho, 2006:1).LINKS builds on this system to provide information on anticipated livestock movements, the problems associated with water, potential disease outbreaks and emerging conflict areas which are influenced by environmental factors. This helps

pastoralists to deal with problems before they occur. According to Mulenkei (2006:6), modern systems are designed to benefit livestock keepers but these people live in rural areas where there are no internet services or mobile phone networks. If information is limited or lacking all together, providing information through regular and timely price broadcasts may have significant positive effects as it will help the pastoral community to plan.

2.2.5 Effects of climate variability on livestock

According to Orindi et al. (2008:1),Kenya experiences major droughts every decade and minor ones in three to four years with the exception of the arid northern part where it is experienced yearly. These droughts have resulted in immense losses in resources and affected the livelihoods of many who depend on the ecosystem for survival, particularly the pastoralists. The enormous changes due to unreliable rainfall means forage is affected as the ground remains dry and nothing grows. This affects forage quality and quantity, the time it takes to grow and it also affects water quality and quantity. As a result of this, livestock productivity goes down and sometimes the livestock die. In Kenya pastoral communities have suffered most from recent climate extremes in the country. The 2000/2001 and 2006 droughts were the worst in at least 60 years, and between these extreme years, several other rainy seasons have failed (Orindi et al., 2008:2).

Baird (2008: 4) points out that in northern Kenya increasingly severe and frequent droughts as well as major floods have devastating impacts on pastoralists. Traditionally, pastoralists have survived by herding animals in a harsh environment. However, the drought of 2005-2006 led to a 70% fall in the size of their herds of cattle, goats and sheep.This situation left 80% of the pastoral communities poor and, as a result, become dependent on relief food (Baird, 2008:4). Pastoral

communities, which rely heavily on natural resources and their livestock, have over centuries developed a way of life that has coped with the vagaries of the climate, even severe droughts. However, more frequent extreme weather means it is more difficult for them to recover after each incidence of drought. According to Oxfam GB (2008:19) over the past few decades greater pressure has been put on pastoralist grazing lands and water resources, as populations have increased and grazing land has been taken for cultivation, conservation areas, and state use. Pastoral livestock has been squeezed onto lands that are too small to be sustainable for pastoral production, as pastoralists rely on freedom of movement to get their herds to grazing grounds and water sources, seriously hampering their ways of coping with droughts.

2.2.6 Impact of climate variability on food and water security

As a result of climate variability, some regions experience frequent and prolonged droughts while others are affected by increased and unpredictable precipitation leading to flooding, both of which undermine food security and increase vulnerability. Also, fresh water supply is threatened by an increase in the frequency of droughts and an incursion of sea water in flood-prone and coastal areas. In Tanzania and Kenya these extreme weather conditions lead to crop failure, scarcity of pasture, livestock deaths and conflicts over resources. This has led to economic losses and made indigenous people dependent on emergency relief food supply and water (Serigne and Verchot, 2006: 11).

2.2.7 Climate variability and conflict

According to Serigne and Verchot (2006:17), there is a relationship between climate change among the pastoral communities and conflicts. Frequent droughts force communities to compete

for scarce natural resources such as water and pastures. Recent research has shown that although pastoral communities have been having conflicts related to cattle rustling because of recurrent droughts, their tensions have intensified in the recent past. There is a relationship between cattle raiding and climate variability since raiding is becoming a strategy for restocking after droughts (Serigne and Verchot, 2006:17). In addition, conflicts prevent pastoral communities from accessing regions which they used to use as fall-back areas and this causes spatial overgrazing in secure areas leading to land degradation (Kagunyu et al., 2008: 15).

2.2.8 Climate variability and livestock diseases

According to Moenga (2010:2), climate comprises many factors including temperature, rainfall, humidity, winds and altitude that have both direct and indirect effects on animal production and health. It affects the quality and quantity of feedstuffs such as pasture, forage and grain and the severity and distribution of livestock diseases and parasites. At the same time, livestock is very critical as a source of food and livelihoods in the ASAL areas which are occupied by pastoralists and also contributes to the national economy of Kenya (Moenga, 2010:2). Therefore, livestock diseases are a threat to pastoral livelihoods and the Kenyan economy. Moenga (2010:9) gives an example of Rift Valley Fever which is associated with heavy rainfall and flooding. Ngeiwa et al. (2012:74) state that Rift Valley Fever is a mosquito-borne virus closely associated with heavy rainfall and afflicts people and livestock. A report by Serigne and Verchot (2006:14) indicates that the outbreak of Rift Valley Fever in 1997/98 as a result of the *El Niño* rains killed up to 80% of livestock in northern Kenya and Somalia and led to the banning of livestock imports from suspect countries. The disease reappeared in Kenya in late 2006 and spread to Sudan and Tanzania. It affects cattle, camels, goats, sheep, as well as wild ruminants and various small

rodents (Ngeiwa et al., 2012:74). This resulted in loss of income for pastoralists from the banned countries.

Ndikumana et al. (2000:45) alsopoint out in their report that there were livestock diseases as a result of drought and *El Niño*. According to them there were higher incidences of diseases especially parasitic and viral ones, in the phase of droughts than in the El Niño phase.Mboya (2008:1) indicate that some diseases such as contangious Bovine pleura pneumonia, rinderpest, East Coast Fever, lumpy skin disease, anthrax, Newcastle disease and Gumburo diseases have become very common. According to Gathuma and Mutiga (1997: 61) some of these diseases do not cause high mortalities but they are highly infectious and cause severe economic losses due to reduced productivity as well as trade restrictions in livestock and livestock products.

2.2.9 Climate variability and human diseases

Climate strongly affects agriculture and livestock production and it also influences animal diseases, vectors and pathogens, and their habitats (Pinto et al., 2008:599).According to Githeko and Woodward (2003:45), climate change and variability will have pronounced health problems. IPCC (2002:13) also indicates that climate variation has led to increased intensity of infectious diseases. A study by Saleemul and Reid (2005:9) indicates that many vector and water-borne diseases are influenced by the climate. Climate variability may increase the prevalence of some vector-borne diseases (for example, malaria and dengue fever) and vulnerability to water, and food-borne diseases, e.g., cholera and dysentery. According Githeko and Woodward (2003:45), climatic anomalies associated with the *El Nino* southern oscillation phenomenon have been linked to outbreaks of malaria in Africa. Malaria transmission will be possible in areas that were

formally too cold for the development of the mosquitoes and the parasites. Mutuaet al. (2012:6) observe that climate variability plays an important role in initiating malaria in the East African highlands. According to them, increasing temperatures and changes in the hydrological cycle are likely to increase the number and intensity of outbreaks of highland malaria in Kenya. GOK (2010: 53) indicates that Kenya is vulnerable to a number of climate-related diseases, including malaria, tuberculosis, diarrhoea, typhoid, amoeba, cholera, bilharzias, Rift Valley Fever and dengue fever.Increased morbidity affects the productivity of the population and slows economic development. It also places further burdens on the country's health and social security services which, in turn, necessitate larger budgetary allocations.

2.2.10 Indigenous coping strategies of the Borana community

Pastoral communities have not been passive and helpless victims of climate variability but have been active in maintaining many ecosystems. They can, therefore, play an important role in enhancing the resilience of the ecosystems in which they live (Mulenki, 2008: 53). Pastoralists have been dependent on a natural resource base which has always, to a certain extent, been unstable and unpredictable, meaning that they have always adapted to a changing environment. They have been able to interpret and react to climate change in creative ways, drawing on traditional knowledge and other technologies to find solutions. According to Keya (2001:30), pastoral communities employ a number of strategies to minimize the effects of droughts. The main preoccupation during a drought year is for each household to secure the survival of its herds. Towards this end specific feeding and management strategies are brought into play. Details of the Borana community coping strategies are as given below.

According to Ndikumana et al.(2000: 76)mobility is an inherent strategy of pastoralists to optimise production of a heterogeneous landscape under a precarious climate. Livestock mobility has two dimensions. The first is resource utilization mobility, which is a response to unpredictable forage and water availability. The strategy allows pastoral herds to make use of dispersed forage resources when they are available and most nutritious. The distance moved and the degree of flexibility varies with year, location, type of livestock and the community (Kinyamario and Ekaya, 2001:118). The second facet is the drought–escape mobility which involves long distance migration to evade drought conditions in one locality. The distances moved depend on availability of limiting resources and the social and political "environment" shared with neighbours. During such hard times, community survival overrides security risks. The timing of the movement is also very important, as any delay can be disastrous. For example, in the 1971- 1973 drought the Kenyan Borana lost 60-70% of their livestock before reaching Southern Ethiopia for having waited for too long before migrating (Kinyamario and Ekaya, 2001:119).

Herd diversification is another coping strategy used by the Borana pastoral community and this involves maintaining several species/types of livestock. The use of different livestock species has ecological and economic advantage (Kinyamario and Ekaya, 2001:119). Diversification allows for an efficient use of pasture resources and facilitates a more reliable supply of food. For instance, camels and goats are browsers but have distinct vertical differentiation in browse use. Cattle and sheep mainly feed on grasses but during times of herbage scarcity sheep shift towards mixed feeding, supplementing grass with low shrubs. Therefore an area with a diversity of grasses and shrubs will best be used with a mixture of different livestock species each employing

different feeding habits (Kinyamario and Ekaya, 2001:119). The diverse attributes of different animal species are an advantage. A decisive survival factor of mixed stocks of livestock is the difference in their reproductive rates and water requirements. The faster reproductive rates of small stock (sheep and goats) allow for quick sales or livestock exchanges, which can be used later to acquire larger stock. According to Field (2005: 96), camels are also important due to their hardness as they stay for a long time without water.

Herd maximization is another coping strategy used by the Borana pastoral communities against natural calamities. It is both understandable and rational, from a pastoralist's point of view, to strive to keep a large herd of animals. According to Doti (2010: 194), the Borana keep large herds of livestock which serve many functions such as a form of insurance, investment and a hedge against droughts. Large herds increase the chances of livestock survival during droughts and the outbreak of diseases. The herd plays an important role as risk "capital" during prolonged droughts and livestock disease outbreaks. During these times, large herds spread thin the risk of total loss. Further, they are important for post-stress herd rebuilding. In the pastoral system livestock serve as an investment and some kind of insurance during periods of pasture and water scarcity, when some animals may be sold to purchase food grains or simply to reduce animal numbers on the landscape (Kinyamario and Ekaya, 2001:119).

Kinyamario and Ekaya (2001:119) suggest that with increased dryness, pastoralists split their herds into smaller groups in order to visit different grazing areas simultaneously. Thus, by moving substantial numbers of livestock from their areas of concentration, the rate of the use of pastures around dry season water holes is minimised. In effect, each range area is used only for a

short time such that vegetation resources remain in good condition. Such intermittent use of resources improves forage vigour and growth. According to Doti (2010:194), apart from the need to meet household requirements, large herds are necessary for building social alliances through transfer of animals to friends and kinsfolk as loans, especially during times of need. Families who lose animals during catastrophes would then approach affines for assistance in replenishing their herds. This is an essential element in a production system operating in an environment where government insurance or formal governments are non-existent.

During droughts, pastoral communities search for supplementary feeds for their livestock. This involves cutting and carrying leaves, plants and grass to feed their livestock. According to Keya (2001:30), during periods of extreme droughts, non-convectional diets are usually given to the weak, young, old and lactating animals that remain in the homestead. Among the Samburu pastoralists of Marsabit a plant known as *loisiechi,* whose tuber contains water and starch is given to weak animals and it is believed that this prevents deaths.*Acacia tortilis* pods are another source of emergency feed during droughts. Forages of evergreen shrubs are sought far from hilly areas and along dry river beds, cut and carried back to the boma for the weak livestock (Keya, 2001:30).

Pastoral communities occasionally use wild fruits and vegetables as food during times of natural calamities (Langil and Ndathi 2001: 70). Some of these fruits and vegetables are available during the drought period but others have to be collected before a drought and preserved for use later. Wild fruits include *khona* (*Hyphene coriaceae*), *domog* (*Grewia tenax*), *bejelo* (*Lannea alata*), and *madeer* (*Cordia sinensis*). On the other hand, wild vegetables consist of tubers such as *sumalele* (*Mormodica trifoliolata*) which is boiled in water and mixed with salt and milk to form

a porridge, *buri* which is boiled in water until soft and *hindy* and *ruma (Commiphora spp.*), which are eaten without any preparation (Langil and Ndathi, 2001:70). Leaves from the n*g'orodo* (*Cyphostemma nieriense*) plant also contribute to survival during times when domestic animals are not able to produce sufficient milk, the dietary staple. According to Coppock (1994: 164) gathered bush foods (fruits, gums and roots) assumed great importance during the time of droughts, although they still presented opportunistic sources of nutrients.

2.2.11 External agents and adaptation to climate variability

Adaptation is the process of improving the ability of a society to cope with changes in climatic conditions across time scales, from the short-term (for example, seasonal to annual) to the long-term (for instance, decades to centuries).IPCC (2002:4) defines adaptive capacity as the ability of a system to adjust to climate change (including climate variability and extremes), to moderate potential damages, to take advantage of opportunities, or to cope with the consequences. According to Mitchell and Tanner (2006:5) adaptation is a broad concept covering actions by individuals, communities, private companies and public bodies such as governments. Successful adaptation can reduce vulnerability by building on and strengthening existing coping mechanisms and assets, targeting climate change vulnerability with specific measures, and integrating vulnerability reduction into wider policies (Mitchell and Tanner, 2006:5).The goal of an adaptation measure should be to increase the capacity of a system to survive external shocks or changes.

Orindi et al. (2008:12) state that pastoral communities in Kenya have over the years developed a variety of alternatives to decrease their risks in times of droughts and floods. However, new and persistent environmental, political and social pressures often limit choices that have traditionally

been available, exacerbating their vulnerability.Reid et al. (2010:26) argue that pastoral societies are unable to cope with a drought, a manifestation of climate variability, as indicated by large losses of livestock, widening poverty and frequent famines. Accordingto Reid et al. (2010:28) for pastoralists to cope and recover from negative effects of climate variability there is a need for interventions from external agents such as governments and NGOs. It is obvious that the increased frequency of drought events has challenged the effectiveness of traditional coping strategies. With dwindling natural resources, water and forage, there is little the pastoralists can do to have access to such resources.

According to Serigne and Verchot (2006:9), despite the fact that there have been ongoing efforts at regional and national levels to mitigate the negative impacts of extreme climatic effects, there has been an inherent problem in the way climate variability is tackled in Kenya. Instead of promoting long-term structural development that could reduce the vulnerability of the local communities, the Kenya Government, together with its development partners, provide relief after disasters have struck (Serigne and Verchot 2006:9). This approach has short-comings as it only offers short-term solutions to the crises and it also keeps the local community in a chronic state of dependency. This is an ineffective and costly way of addressing climate-related disasters. For example, during the 2000/2001 fiscal year, Kenya spent KES10.5 billion on relief food (excluding contributions from WFP and other sources). It is argued that with a quarter of this amount, the country could have put in place a more effective and sustainable system to address long-term food insecurity in arid and semi-arid areas (Serigne and Verchot 2006:9).Oxfam GB (2008:27) states that if investment in arid areas is to be meaningful and successful in the long term, national governments have to be able to rely on long-term assistance from donors as well as their own funds.

The government of Kenya has taken significant steps towards drought preparedness and management in recent years (Orindi et al., 2008:5). However, more still needs to be done to strengthen pastoral livelihoods and build adaptive capacity in the long run (Orindi et al. 2008: 9). Facilitating adaptation among pastoralists requires the formulation of appropriate policies the creation and/or strengthening of appropriate institutions to implement these policies, and the political will by the government to address the relevant issues. Government and development partners should support adaptive strategies such as adoption of drought tolerant breeds and species of livestock.

The fact that traditional weather forecasting is dying due to modernization makes it imperative for institutions such as the Meteorological Department to play a more active role in providing current, and useable information to pastoralists. Donors and other development partners also have a role to play in ensuring improved early warning systems through sustained investment as pastoral communities may not have the resources necessary for setting up and maintaining reliable drought early warning systems (Orindi et al., 2008: 10).

For adaptive strategies to work effectively there is a need for the government and agents to provide good infrastructure and connections to markets for those who would like to sell their animals. Nevertheless, infrastructure such as water points to facilitate movements of stock to enable drought time grazing remains important and so should be the focus of development in ASALs (Orindi et al., 2008: 13). Money is also an important resource for adaptation to droughts and other negative manifestations of climate variability.

2.2.12 Identified study gaps

Several studies have been taken done in the study area but they have not exhausted issues of climate variability, livelihood, coping strategies and suitable strategies. For instance, some studies have completely ignored the role of development agents in bailing the Borana out of the challenges they face as a result of climate variability. For example Iona(2011)did a lot of work on the coping strategies used by the Borana but she never looked at the effect climate variability had on these coping strategies. Guyo (2013), on the other hand, looked at the impact of drought on the management strategies of the Borana community but his work had limited information on the effects of climate variability on the Borana livelihoods. Study by Jillo et al, (2006) focused on herd diversification and livelihood diversification as a response to poverty. Their study indicates that the herd diversification coping strategy has become ineffective and they attribute this to human population growth and encroachment of cultivation into key grazing areas. Despite the fact that these factors have been caused by droughts and shortage of rainfall, the study never linked the collapse of the coping strategy to climate variability. The other limitation is that he only concentrated on one coping strategy.

Although several studies have been conducted in the study area about the Borana pastoralists there are still gaps as indicated by the foregoing literature review.

First, there is no study which has been conducted on the effects of climate variability on Borana livelihoods and coping strategies.

Secondly, despite the importance of the indigenous forecasting methods used by the Borana community to predict seasonal climatic events there is very little information

documented.Previous studies have ignored them and tend to focus on the modern forecasting methods.

Lastly, there has been very little anthropological study conducted on the effects of droughts on the livelihoods and coping strategies in Isiolo County.

Therefore, this study endeavored to fill some of the gaps and provide the relevant literature.

2.3 Theoretical frameworks

2.3.1 Cultural ecology theory

Cultural ecology is one of the two theories that guided this study. This theory has roots in subjects such as anthropology, biology, sociology, and geography. It was developed by Steward (1955) who viewed the term ecology as an adaptation to a given environments. This theory is based on the assumption that human beings interact with their ecosystems through their culture in order to cope with the challenges posed by their environment. For many animals it is accomplished by means of their physical characteristics, for instance, bats have wings and sensory organs so that they can exploit a very distinctive environment. The adaptation of human beings, however, is achieved largely by means of culture. Therefore, culture is viewed as an adaptive system that enables human beings to adjust to their environments.

According to cultural ecologists, each culture adapts differently in response to unique environmental pressures. When searching for food and shelter human beings must use the resources which are available in their environments. The resources available determine the

economic way of life for a given community, for instance, among communities of northern Kenya their environment is suitable for livestock rearing, while those communities living in high potential areas their resources are suited for both cash and food crop production. Likewise, communities found along the lake regions make use of the water which is suitable for fish production. Therefore the environment is very important to all the communities in the world. This means that any alteration of the environment affects all aspects of culture as it directly or indirectly has repercussions on the community that depends on it. An environment can be affected through climatic conditions (drought and floods), the introduction of new technologies, economic activities such as the construction of dams, irrigation schemes, hydroelectric projects andthe introduction of new crop varieties. When the environment is affected the communities depending on it do not just sit and wait for nature to take its course, but come up with coping strategies which enable them to survive. These coping strategies have been passed down from one generation to another through the process of socialization. Therefore, cultural ecology provides a good explanation as to why the Borana community in Isiolo has developed strategies to cope with severe drought.

2.3.2 Relevance of the theory to the study

Cultural ecology was suitable for this study for several reasons. First, it focuses on the pro-active elements of the Borana community especially what they do while faced by calamities which affect their livelihoods. This approach indicates that the Borana are not passive recipients of the vagaries of their ecosystems but are active in modifying and adjusting themselves to these ecosystems and they do this using their culture. Njiro (1994:34) views culture as the enabling device through which humans begin by adapting and end up controlling their environments. As a result of this many environments have increasingly become cultural environments due to human

adaptations. The relationship between culture and environment explained by this theoretical framework involves a dialectical interplay of the element of culture and environment. This means that culture influences the environment and the environment affects culture.

Second, cultural ecology allows a proper grasp of the Borana community's understanding of climatic conditions (droughts and floods). The way culture utilizes its environment is a function of the way it perceives and conceptualizes that environment. Thus, the Borana community's knowledge of severe and prolonged droughthas enabled it to come up with coping strategies which enable them to utilize its harsh environment. These strategies consist of livestock migration, herd diversification, herd maximization, supplementary feeding and eating wild fruits.

Finally, cultural ecology also recognizes that any environment is organised according to the verbal categories of those who use it. Therefore, this theory enabled this researcher to explain the extent to which the pastoral coping strategies have been affected by climate variability.

2.3.3 Resilience Theory

Resilience theory also guided this study. Zhong et al. (2010) defines resilience as the capacity of a system to absorb disturbance and reorganize while undergoing change so as to still retain essentially the same function, structure and identity. It is the ability of a system to remain functionally stable in the face of stress and to recover following a disturbance. One paradox of this concept is that a more resilient system implies more flexibility and hence less tight controls, but resilient systems are also defined as those able to maintain their controls and structure. An additional element of resilience theory is the recognition that systems and their contexts are

continually changing. Thus, resilience must also include a capacity for learning or restructuring new adaptations that often involve increased organizational complexity. The term "resilience" originated in the 1970s in the field of ecology from the research of Holling, who defined it as *"a measure of the persistence of systems and of their ability to absorb change and disturbance and still maintain the same relationships between populations or state variables"* (Holling, 1973:14). Resilience is the capacity to adapt successfully in the face of threats or disaster. People can improve their capacity for resilience at any time of life. Resilience is not something that you are either born with or not;it develops as people grow up and gain better thinking and self-management skills and more knowledge. Resilience comes from supportive relationships with parents, peers and others, as others as well as cultural beliefs and traditions the help people cope with the inevitable bumps in life. Resilience is found in a variety of behaviours, thoughts, and actions that can be learned and developed across the life span in a number of ways.

Galaz (2005:9) views resilience as the capacity of an ecosystem to tolerate disturbance without collapsing into a qualitatively different state that is controlled by a different set of processes. A resilient ecosystem can withstand shocks and rebuild itself when necessary. Resilience in social systems has the added capacity of humans to anticipate and plan for the future. Humans are part of the natural world and since environmental changes are inevitable, human beings comes up with coping mechanisms so as to survive. For instance, droughts are natural phenomena and they affect the social and economic well-being of the Borana community. At the household level the effects manifest themselves in loss of productivity. Resilience theory assumes that risks should not be avoided but instead there is need to come up with strategies and mechanisms that address the adversity and bounce back. This gives explains as to why the Borana pastoralists engage in pastoralism, a land-use system which puts into profitable use scanty and sparsely

distributed resources of the marginal areas without doing damage to the ecology. The fragility of the ecology, scantiness of the land resources and their scarcity due to low and erratic rainfall made it imperative for them to develop well balanced resource utilization regimes. They developed herd management practices which include livestock mobility, herd diversification, herd maximization, supplementary feeding (cut-and-carry) and relying on wild food plants. These survival strategies are embedded in their cultural institutions and they are passed on from generation to generation. The Borana knowledge on droughts is determined by their nature to survive despite the problems which exist in the environment.

Resilience requires social, institutional, and informational resources that enable a community to respond effectively to a hazard effect (Zhong et al., 2010). Social resources involve social networks among community members that will help build the capacity of communities to work together in adapting to climate change. Institutional resources involve governmental, non-governmental and community-based organizations which assist the Borana community during severe droughts. According to Tompkins and Adger (2004) argue community-based management enhances adaptive capacity by building networks that are important for coping with extreme events. Informational resources are all sources of information such as research stations and academic institutions. Tompkins and Adger (2003) argue that building resilience through consolidation of social networks is useful in building resilience.

2.3.4 Relevant of resilient theory to the study

According to Zhong et al. (2010), resilience is the ability of a system, community, or society to adapt to fluctuation in order to maintain an acceptable level of functioning. Advocates of resilience theory emphasize on four aspects, that is, adaptation, adjustment, transformation and

reorganisation. Resilient theory is concerned with adaptations. Systematic adaptations imply that new coping systems are created over time. Njiru (1994) observes that the precise nature of a people's adaptation to the geographical site is equivalent to their adaptations within their culture. For instance, in the case of the Borana community of Isiolo they have been known as cattle keepers but with emergency of severe and recurrent droughts they have adapted to camel rearing. The underlying principle is that in the cause of their interactions with their environment people act towards things on the basis of the meaning those things have for them. Their definition of their situation undergoes revision, and reconstruction, overtime, as the process of interaction changes.

Resilience theory also emphasizes on adjustment if the situation deteriorates and this is what has happened among the Borana pastoralists of Isiolo County who have been forced to adjust to some non–pastoral pursuits due to climate variability. These non-pastoral activities include petty trade, small-scale farming, casual labour and formal employment. The action taken by human beings when they are hard hit by disaster depends on how hard they are hit and the options available for them.In the current study the Borana have undergone major adjustments for them to survive due to the effects of severe drought. Frequent and recurrent droughts have made the Borana change and redefine their lifestyles, including eating habits, housing, gender-based roles and livelihoods.

On transformation,there has been influx of movement of young men, and women from rural to urban areas such as Nairobi, Nanyuki, Nyeri, Isiolo and Thika in search of jobs. Families that

have lost their livestock as a result of droughts and floods also migrate to areas where they can have access to relief food, water and medicine.

Resilience theorists add a key fourth function- reorganization or the phase, in which resources are reorganized into a new system to take advantage of opportunities. The innovation here is that this "new" system may resemble its predecessor or have fundamentally new functional characteristics. This is indicated by the Borana community settling in towns where they can have access to relief food, water and medicine. The community has also developed another system of livestock mobility whereby it is only men who move with livestock while women, children and the elderly are left behind. People have also increased the distance travelled, and changed migratory routes and destinations as mitigation measures against frequent and severe droughts. Recurrent droughts haveled the community to shift from an old strategy that was centred on socio-cultural cattle pastoralism to new livelihoods that are dependent on camel and small stock. Even those clans which used to view camel keeping and eating their products as a taboo have had to embrace camel rearing.

CHAPTER THREE

METHODOLOGY

3.1 Introduction

This chapter gives details of the methodology used in the study. It begins by describing the research site, andthen describes the research design, the target population, the sampling procedure and the techniques of data collection and analysis. Lastly, it describes the ethical considerations in the study and discusses briefly the problems encountered during data collection and how they were solved.

3.2.1 Research site

This study took place in Isiolo County which is situated in northen Kenya(Map 3.1). The county borders Marsabit County to the north, Garrissa to the south-east, Wajir County to the east, and Meru County to the south (GoK 2005a:12). The county covers an area of 25,605square kilometres. It is divided into six administrative divisions, namely, Central, Garbatulla, Sericho, Merti, Oldonyiro and Kinna (GOK, 2004: 3). Most of the county is a flat, low lying plain, which rises gradually from an altitude of about 200metres above sea level at Lorian Swamp in the Northern part to about 300metres above sea level.

The county is semi-arid since it is hot and dry most of the year. It has two rainfall seasons, the long and short rains, with the long rains coming mainly in March and May while the short rains come between October and November (GOK, 2004:2). Rainfall is scarce and unreliable, which means it cannot support perennial agricultural crops (Mati et al., 2005:4). The county is covered by vast areas of shrubs and grasslands suitable for ranching.

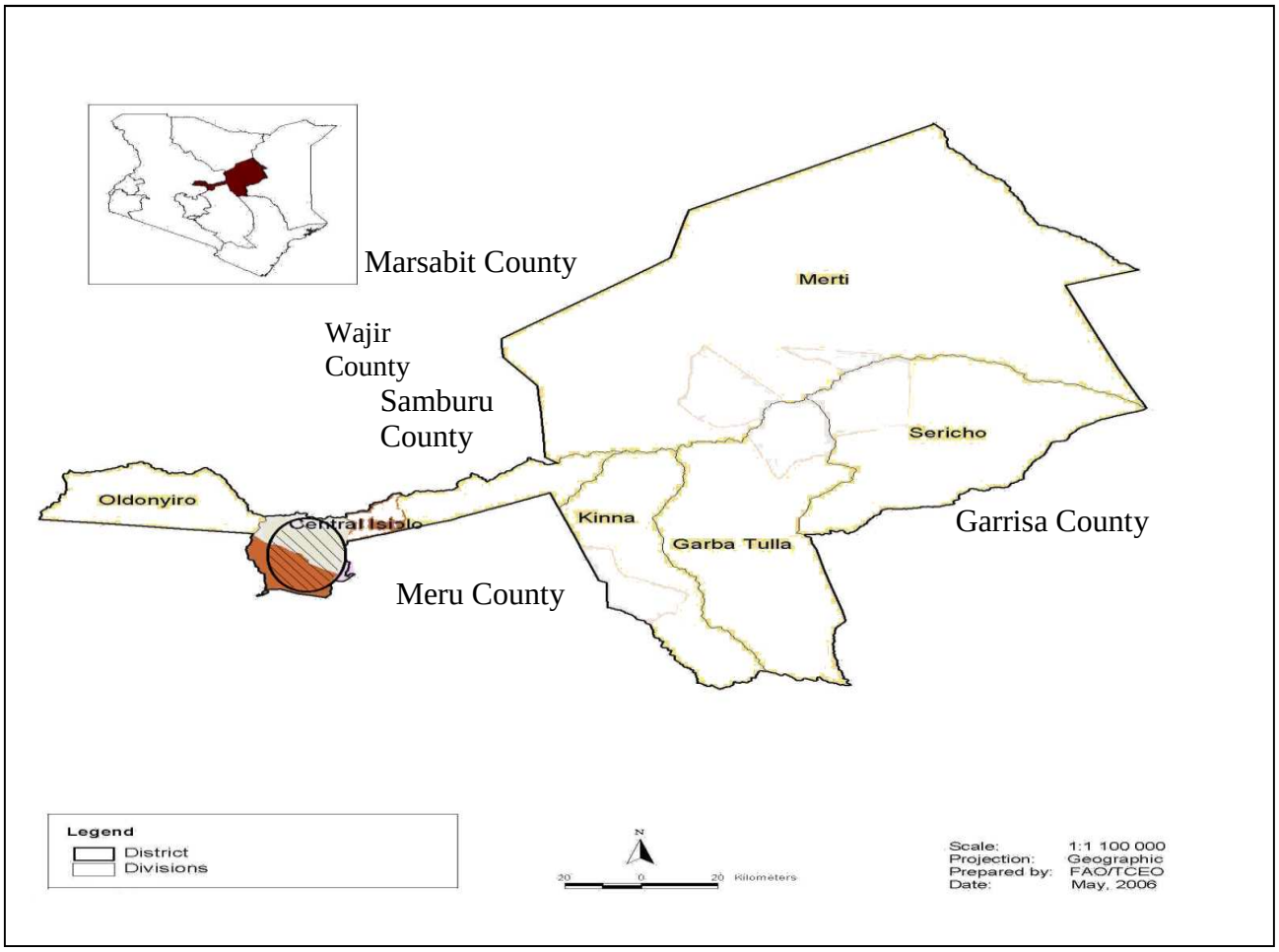

Figure 3.1: Administrative boundaries of Isiolo County (Source: GOK 2008)

3.2.2 Population Size and Composition

According to the 2009 population census, the county had a total population of 143,294, comprising of 73,694 males and 69,600 females (GOK, 2013:8). This implies that the Countys population male to female to female ratio is almost 1:1. The population density of Isiolo County is 6 persons per square Kilometre. The population of Isiolo comprises of the Borana who are the majority, Ameru, Turkana, Somali, Samburu, Rendille, Sakuye, Gabra and government civil servants such as the Agikuyu, Luo, and Abaluyia (GOK, 2008:5).

3.2.3 Climate and Climatic Zones

The County has three climatic zones, semi-arid arid and very arid ((GoK, 2005a: 2).

The characteristics of these zones are as follows:

Semi-arid zone IV: This covers the Central and Kinna divisions (about 5 percent of the total area of the district). Rainfall here is 250-650mm perannum.

Arid Zone V: This covers Central Garbatulla divisions and is 30% of the area.The rainfall here is between 300-350 mm per annum and can only support annual grasslands and a few shrubs.

Very Arid Zone VI: This area covers Merti and Sericho divisions which is nearly 65% of the district area. The rainfall here is between 150 and 250mmper annum.

3.2.3 Livelihood Zones of Isiolo County

The GoK report (2011:1)indicates that IsioloCounty comprises four livelihood zones. The livelihood zones includes pastoral zone**;** this is the most predominant means of livelihood in the county and it includes livestock of all species; casual waged labour zoneconcentrated in the central division within Isiolo town; agro-pastoral zonewhichderive their livelihood from agro-pastoral activities involving livestock keeping and growing of maize and beans which is mainly

concentrated along the Ewasonyiro river, upper parts of Kinna and Central divisions; and Firewood/charcoal burning zone which is common in the outskirts of Isiolo town(GoK, 2009: 9).

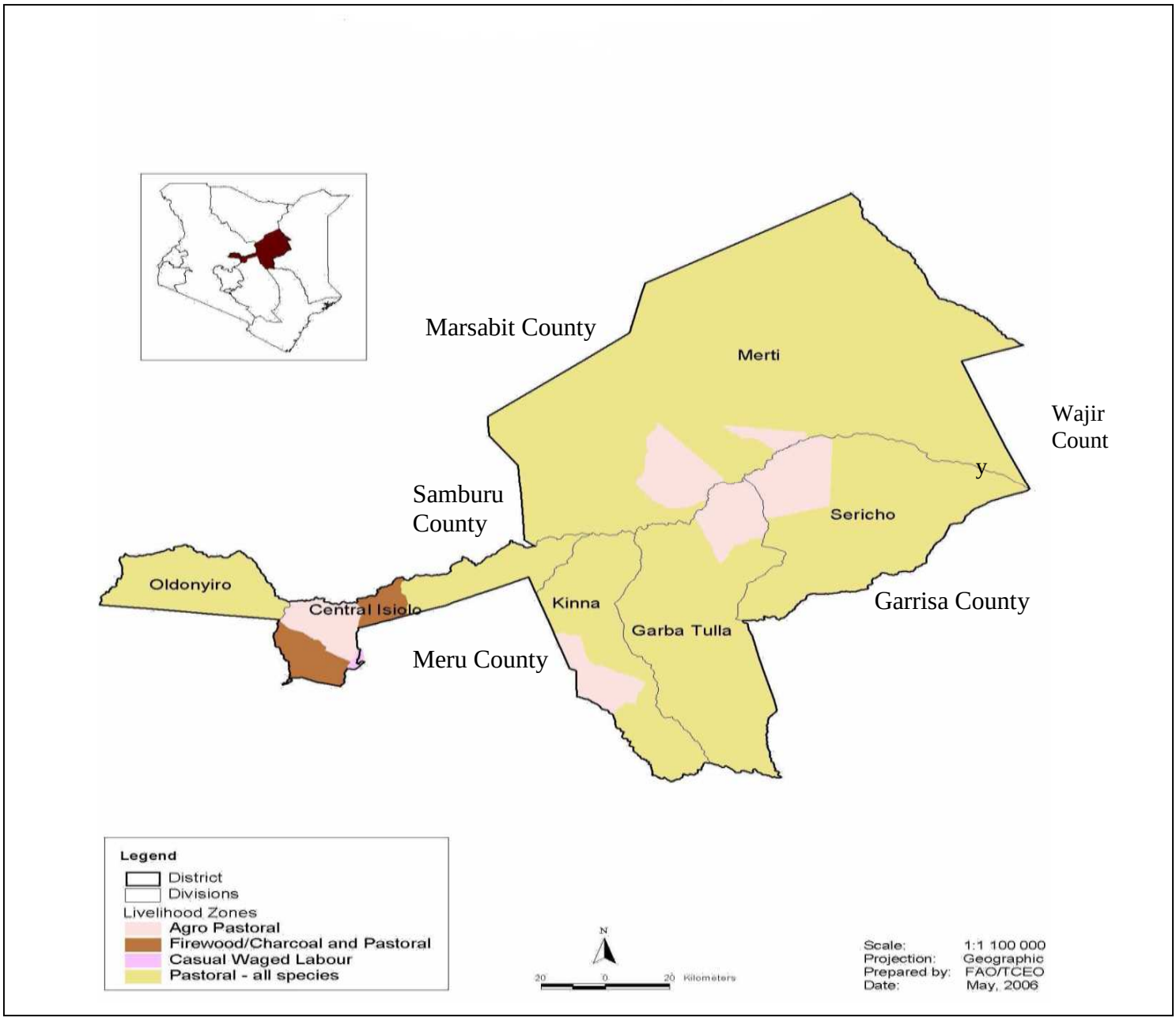

Figure 3.2: Livelihood zones in Isiolo County (Source: GoK 2004)

3.3 Economic activities of Isiolo County

3.3.1 Livestock production

The major economic activity of the inhabitants of Isiolo County is livestock production (GOK, 2002: 27). The livestock reared include cattle (Borana breed), camels, sheep, goats, donkeys and poultry (GOK, 2004:2). The concentration of livestock is highest in Sericho, followed by Merti, Central/Oldonyiro and, finally, Garbatulla/Kinna. The main mode of livestock production is free range whereby livestock graze and browse freely in the extensive range-land.

Dairy farming is also practised on a small scale in Central Division around Isiolo Town along river Isiolo. The dairy cattle comprise crosses of local breeds (that is, Zebu or Borana), with Freshian, Guernsey, Jersey and Sahiwals. The amount of milk produced in the county is not sufficient for the inhabitants of the county and much of the milk consumed in Isiolo town comes from Meru County (GOK, 2005b:21).

3.3.2 Agricultural Activities

Crop farming in the county is limited to the wetter areas of Central and Kinna Divisions which receive some considerable amounts of rainfall (GOK, 2012:7). There are four big perennial rivers in Isiolo County, namely, Ewaso Nyiro, Isiolo, Kima and Bisanadi. Most irrigation schemes are found along these rivers (GOK, 2005a: 7). The types of crops grown include maize, beans, sorghum, cowpeas, onions and tomatoes. According to GOK (2005b:8) Isiolo County is not self-sufficient in food production and it is a net importer of food from neighbouring counties such as Meru, and Laikipia. Central Division has the largest number of farm holdings and hectareage under cultivation. According to GOK (2012:8) crop production in Isiolo County is

practised under rain-fed and irrigated agriculture. The average size of the farm holding capacity is 0.5 hectares. However, thereis little use of agricultural inputs in the County leading to low productivity.

3.3.3 Tourism

The county has great tourist potential. According to GOK (2005a: 8) there are a number of game reserves which accommodate some of the rare species of giraffes, zebras, ostriches, antelopes, elephants, buffalos, rhinoceroses, lions, cheetahs, and hyenas. The county has three game reserves, namely, Sihaba Game Reserve, Buffalo Springs and Bisanadi National Reserve. These reserves provide income and employment to the local communities (GoK, 2005a: 12).

3.3.4 Industrial activities

The County has limited industrial activities and the major industrial activities are carried out in the urban centres of which Isiolo town is the main one (GOK, 2005a: 23). According to GOK (2005b:23),the manufacturing activities carried out in the county include bread making, flour milling, metal fabrication, welding, furniture making and handcrafts.

3.4 Research design

This study was cross-sectional in nature and both qualitative and quantative methods of data collection were employed. Data were collected using household interviews, direct observation, focus group discussions and key informant interviews. Qualitative data were analyzed according to the themes in the research objectives. Quantitative data were analyzed using the SPSS software and the results are presented in tables, bar charts and pie charts.

3.5 Study population and unit of analysis

The study population consisted of Borana men and women household heads in the three villages of Isiolo County, that is, Kambi Odha, Kambi Mbule and Kambi Garba. The unit of analysis was the individual man and woman household.

3.6 Sample size and sampling procedure

This study applied both random and non-random sampling strategies. In selecting the study site simple random sampling technique was applied whereby the names of the three Isiolo sub-counties were written on pieces of paper which were folded several times. The pieces of paper werethen put in a container which was shaken before the researcher picked one of them. This happened to be Isiolo Central. Three villages were selected purposively with the help of the local provincial administration who assisted to researcher to identify the three villages which were occupied by the Borana community. The villages identified were Kambi Odha, Kambi Mbule and Kambi Garba.

To get a representative sample size this study used a formula used by Mugenda and Mugenda (1999: 43-44).

The sample size was determined as follows: n= Z2pq/d2

Where:
n = the desired sample size (if the target population is greaterthan 10,000)
z = the standard normal deviate at the required confidence level
p= the proportion in the target population estimated to have characteristics being measured
q =1-p.
d = the level of statistical significance set
Since the target population is less than 10,000, the final sampleestimate (n*f*) was calculated as follows:
n*f*=n
1+n/N
Where: n*f*= the desired sample size (when the population is lessthan 10, 000).

n = the desired sample size (when the population is morethan 10,000)
N = the estimate of the population size (Mugenda and Mugenda, 1999).
When the population is more than 10,000 households, 384 of them are recommended as the desired sample size (Mugenda and Mugenda, 1999: 43). The accessible population in this study was 4000households.

Mugenda and Mugenda recommend the formula:

$$nf = \frac{n}{1 + \frac{n}{N}}$$

to be used to calculate samples size.

Using the above formula sample size is:

$$nf = \frac{384}{1 + \frac{384}{4000}} = 350$$

To cater for those households that would decline to participate or drop out during the process of investigation, the study proposed a sample size of 400.These consisted of 206 men and 194 women. The proportion of men was more than that of women because men were the ones who were readily available.

Systematic sampling was applied to select households for the interview. The sampling interval was determined by the equation given below.

$$Sampling\ interval = \frac{n}{N}$$

Where:

n= required sample size
N=Population size

n=400
N=4000

$$Sampling\ interval = \frac{400}{4000} = \frac{1}{10}$$ (i.e., 1 in 10)

Micro soft excel FUNCTION **=RANDBETWEEN(1, 10)**was usedto select a random starting number for the first household to be included in the sample, which happened to be number 8. The 8th household was from village 1 since the households were assigned numbers starting from village 1, 2 and then village 3.

3.7 Data collection methods

3.7.1Secondary sources

The literature reviewed for this study included available literature on the Borana, climatic conditions (drought and floods), coping strategies, and adaptive strategies. Secondary sources included books, research papers andreports, and online publications.This method was used continuously throughout the life-span of the study.

3.7.2Household interviews

Household interviews were conducted with household heads, male or female, through the administration of a questionnaire (Appendix1) to the respondents. The interviews were conducted in Borana local language by enumerators who were from the community. The enumerators were recruited and trained before the actual collection of the data took place. In a household identified for the interview and the head was not present at the time of the visit, effort was made to revisit the household until one of them was found and interviewed.

The questions answered by household heads wereon the experiences they had of climate variability,occurrences of droughts, normal rains, *El Niño*, rains, and floods. They werealso asked to give their perception of droughts and early warning signs of droughts, rains and floods.They were also asked to give effects droughts had on their livelihoods andcoping strategies. They also gave answers on the external agencies which were assisting the pastoralists to cope with various disasters and the type of assistance the communities received from assisting agents.

3.7.3Key informant interviews

Key informants were selected purposively and the focus was on those informants with rich information on the topic and who were willing to share the information which they had, in order

to increase the scope or range of the data. A total of 12 key informants were interviewed, which included chief's representative Kambi – Odha, elder Kambi Mbule, chief's representative Kambi Garba,senior chief Isiolo Central, abiometrician EDA, project coordinator food for the hungry, Livestock officer, Agricultural officer, project coordinator Arid-lands, Kenya forest service officer, water and irrigation officer and NALEP officer. A key informant interview guide (Appendix 2) was used to guide the interviews.

The key informants answered questions on the experiences they had of climate change in Isiolo and what they have witnessed on early warning of droughts, floods and rain among the Borana community. They were also asked to give the effects of drought on the Borana coping strategies, their livelihoods and their social well-being. They also gave answers on the external agencies which were assisting the pastoralists to cope with various disasters and the type of assistance the communities received from assisting agents. Key informants also came up with adaptive strategies which they thought would be more suitable for the study area. Information received from the key informants was recorded in field notebook and in the course of the day this information was cross-checked and any additional information was noted down.

3.7.4Focus group discussions

The researcher had initially anticipated to conduct three focus groups one in each village but it was not possible to conduct a focus group in Kambi Garba due to insecurity since it was intensive in that village. Therefore, only two focus groups discussions were conducted in Kambi Odha and Kambi Mbule. Each group had 10 participants who were selected purposively. Each group had men and women who were above 45 years of age. The issues discussed included the people's understanding of climate variability, the indicators of climate variability, historical

trends in climate variability, and the community's early warning systems for normal rain, floods and drought. Other issues included difference in experience of drought which used to occur in the past decades and the current droughts. Issues on coping strategies used in the past,and how they have been affected by drought were also discussed. Other issues discussed included how vegetation, land forms and livelihoods of the Borana community have been affected by drought and the type of livestock reared by the community today and if there were any changes. A focus group discussion guide (Appendix 3)was used to guide the discussions.

3.7.5 Direct observation

Direct observation was another method used to collect data. The main advantage of observation was its directness as it enabled to study behaviour as it occurred. The researcher did not ask people about their own behaviours and acts of others but she watched individuals act. The study used non–reactive or un-obstructive observation, which is a strategy for studying people's behaviour or surroundings without them knowing that they are being observed. This eliminated the problem of informants playing to the audience.This method was applied concurrently with focus group discussions, and household interviews. In a few cases time was spared to visit the river valleys and to observe the vegetation. The researcher was interested in observing the surrounding environment of the Borana community, type of vegetation, water bodies existing in the area, type of houses, their way of dressing, types of foods eaten, activities which they engaged in, and livestock species kept. The researcher also observed the condition of the livestock which were available, type of forages found in the region and wild fruits and roots. A checklist (Appendix 4)was used to collect the information.

This method was applied to complement other methods which were used in data collection. Through observation the researcher learnt a lot about the Borana community. There was clear

indication that the Borana community has been engaging in various activities other than livestock keeping as evidenced by the many people who were engaging in small-scale businesses and farming.

3.8 Data processing and analysis

Data obtained from focus group discussions, key informant interviews and direct observation were sorted out and interpreted in relation to the research objectives, to enable the researcher to provide overall interpretation of the findings showing how thematic areas and issues relate to one another. These themes include: Awareness of climate variability; effects of drought on livelihoods; effects of drought on coping strategies; and development agents offering assistance to the community.

The use of verbatim quotes was used not only for the purpose of emphasis and authenticity, but also to ensure that the actual meaning of the statements by informants was not lost in general translation.On the other hand, quantitative data derived from the household interviews were edited, coded and analysed using the Statistical Package for Social Sciences (SPSS) software version 20 spread sheets. Descriptive statistics were run to give frequencies and percentages. Tables, pie charts and bar charts have been used to present the findings.

3.9 Ethical considerations

Before data collection started, permission was sought to conduct research in Isiolo County from the provincial administration. Permission was also enlisted from individual study informants. Before conducting any interview explanations were given to the respondents concerning

confidentiality of the information given. The study ensured privacy and confidentiality of the respondent by avoiding the use of their names and by using codes instead. This was maintained through-out the whole process of data collection.

3.10 Problems encountered in the field and their solutions

Several problems were encountered in the field. First, just before the study started the Borana and the Turkana ethnic communities started fighting and it was not possible to conduct any interviews. Thus, the researcher postponedthe fieldwork until the local area chiefs assured herthat there was peace. Insecurity also complicated the data collection process in Kambi Garba as many people had migrated to Isiolo town for security. This was solved by replacing the households with others.

The other problem was that some of the households were reluctant to give responses as they wanted to know how they were going to benefit as individuals and also as a community. This problem was solved by informing them that the findings of the study would assist policy makers to make informed decisions in addressing their problems.

CHAPTER FOUR

UNDERSTANDING OF CLIMATE VARIABILITY BY THE BORANA

4.1 Introduction

This chapter is divided into two parts. The first part presents the socio-demographic characteristics of the household heads while the second one details the findings on droughtits indicators.

4.2 Socio-demographic characteristics of respondents

4.2.1 Age

Table 4.1 shows that the age of the respondentsranged from 20 to 60 years and above. Thirty-five per cent of them were in the 31-40 age category while 25.7% belonged to the 41-50 age category. On the other hand, 17.8% were aged 51-60 years and 11.7% were aged 20-30 years. The category with the least number of respondents was that of those aged 61years and above which had only 9.8% of the respondents.

Table 4.1: Age categories of respondents

Age	**Frequency**	**Percentage**
20-30	47	11.7
31-40	140	35.0
41- 50	103	25.7
51-60	71	17.8
60 and above	39	9.8
Total	**400**	**100**

4.2.2 Marital status

The findings showthat most (85.5%) of therespondents were married. On the other hand, 8% of therespondents stated that they were widowed, 3% were divorced, 2.5% were single and, lastly, 1% were separated. Information acquired from focus group discussions and key informants indicates that marriage is a highly cherished cultural practice among the Borana community. Every adult male and female is expected to get married and have his or her own children. Marriage at an early age for girls was very common and any girl who had attained the age of 18 years was expected to get married unless she is in school or college. Focus group discussions suggested that cooperation in the family is highly valued and makes most of the coping strategies employed by the community more effective.

4.2.3 Educational background of therespondents

Figure 4.1 shows the level of education of the respondents. Over a half (55%) of them had no education at all and this was followed by 20% who had primary education. On the other hand, 12% stated that they had secondary education,while 13% said that they had attained college or university education. This category included any respondent who had joined any post-secondary institution. These findings suggest that thelevel of education of the household heads was generally low. Undoubtedly, low levels of education in the study area made people depend a lot on subsistence livestock keeping, a sector which is highly impacted by climate variability.

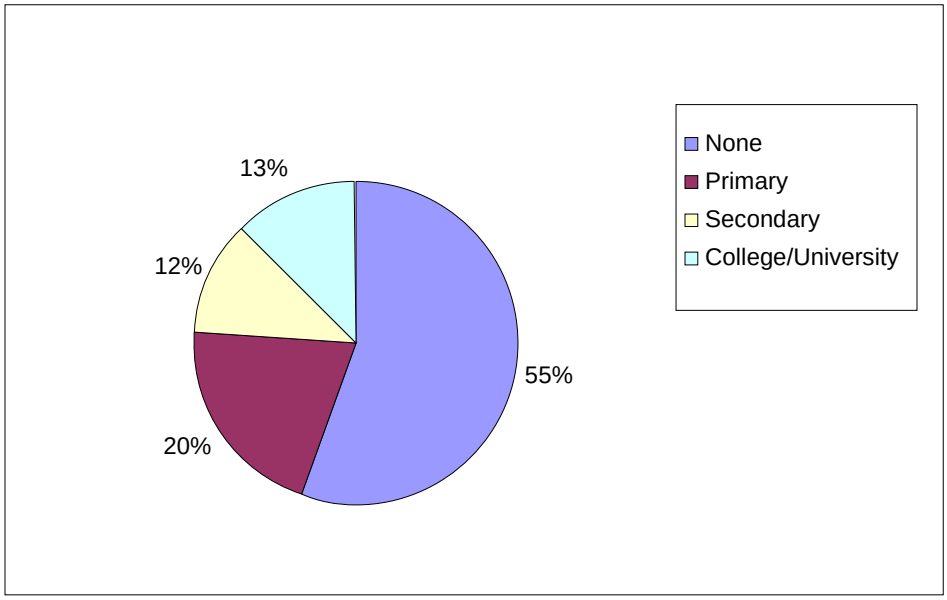

Figure 4.1: Level of respondent's education

4.2.4 Occupation

From Table 4.2, slightly more than a third (33.5%) of the respondents were house wives. On the other hand, 19.7% were pastoralists, 19% were salaried employees, 12.3% were small-scale business operators, 6.3% were agro-pastoralists, 5% were casual labourers and, lastly, 4.2% had no occupation. Those who stated that they had no occupation said that their livestock had died due to frequent droughts and what had remained was raided by the Turkana.

Table 4.2: Occupation of respondents

Occupation	**Frequency**	**Percentage**
House-wives	134	33.5
Pastoralists	79	19.7
Salaried employees	76	19.0
Business persons	49	12.3
Agro-pastoralists	25	6.3
Casual labourers	20	5.0
None	17	4.2
Total	**400**	**100**

4.3.1 Perceptions of climate variability

Study findings suggest that the Borana people of Isiolo County are aware of climate variability. They stated that climate has changed and as a result droughts have become more frequent than they used to be before. They have a local name for the situation which they refer to as *jijirama qilesa*, that is, 'change of climate'. This local term is descriptive of what has been happening as people have witnessed changes which they associate with climate variation. This is consistent with a GOK (2010:28) report from the Kenya Meteorological Department (KMD) which observes that there is evidenceof climate change and variability nationally over the last 50 years. The GOK (2010:28) report on the northern and north-eastern Kenya regions indicates that since 1960 the minimum temperature has been increasing with a magnitude of 0.7-1.8 °C while the maximum temperature has been increasing with a magnitude of 0.1-0.7 °C.

Figure 4.2 presentstheexperiences of respondents associated with climate variation. As indicated by the figure, slightly more than half (53%) of the respondents stated that they had experienced prolonged droughts. On the other hand, 31% said that they had experienced shortages of rainfall and changes in rainfall patterns. In addition, eleven per cent of the respondents stated that there had been floods and*El Niño* rains, 3% had witnessed frequent and violent storms while 2% had experienced seasonal changes.

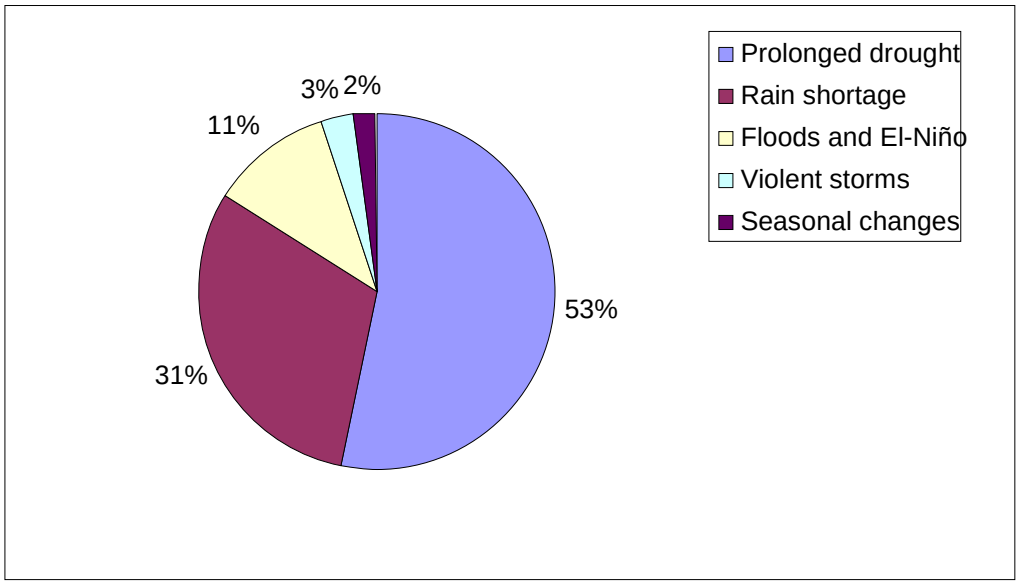

Figure 4.2: Experiences of climate change

Focus group discussants agreed that there has been a change in rainfall patterns. According to them, the long rains used to occur in the month of April but for the last 20 years they occur in the month of October, although sometimes they might come late or fail to come altogether. The rainfall is erratic, and when it comes most of it is spread over a few days or hours causing erosion and flooding. This observation was supported by a key informant in his fifties who was born and brought up in Isiolo County. He described the change using the following statement:

When I was growing up there used to be plenty of rainfall in Isiolo County accompanied by fog, but this has changed and for the last 20 years rainfall has decreased and fog has disappeared. We used to know when the long rains will start and the short rains. This used to determine our movement but today we are not sure when it will rain. Sometimes the rain comes earlier than expected or very late. The seasons are very confusing. **(Key informant, 58years, Chief, Isiolo)**

There was consensus among FGD participants that severe and prolonged drought has affected the water levels of rivers in Isiolo County. They were thus in agreement with the following statement from one of them who stated that:

When we were growing up, rivers Isiolo and Ewaso Nyiro used to have a lot of water. During heavy rains they used to overflow all over the flood banks. Today even if there is heavy rain the rivers do not overflow as they used to do in the past. The water levels of our rivers have gone down by 60 %. **(FGD, Kambi Odha, Isiolo)**

The respondentsindicated that they had experienced prolonged droughts, shortages of rainfall and changes in rainfallpatterns, the *El Niño* phenomenon, frequent storms and seasonal changes.Similar findings were also reported by IOMs (2010) in their work among the Turkana of Northern Kenya which indicates that the community also relies on environmental and seasonal indicators to illustrate changes in the ecological processes caused by climate variability. Such indicators include the frequency of droughts, the dryness of rivers and streams that used to flow throughout the year, changes in rainfall patterns in time and by prediction, the disappearance of certain grasses or forage and herbaceous plant species, bush encroachment of rangelands, the intensity of floods and run-offs, bare and barren soil, the frequency of conflicts, the mating

patterns of livestock, the changing seasons of certain flowering plants, and the prevalence of certain insects, birds and diseases

4.3.2 Perceived causes of climate variability

Respondentsin the study area were asked on what they perceived as the cause of climate variability. They attributed the cause of climate variability to three factors as shown inFigure4.3.Specifically, 55 % of the respondentsattributed it to human-made factors, 23% to God's doing and 22% to natural factors.

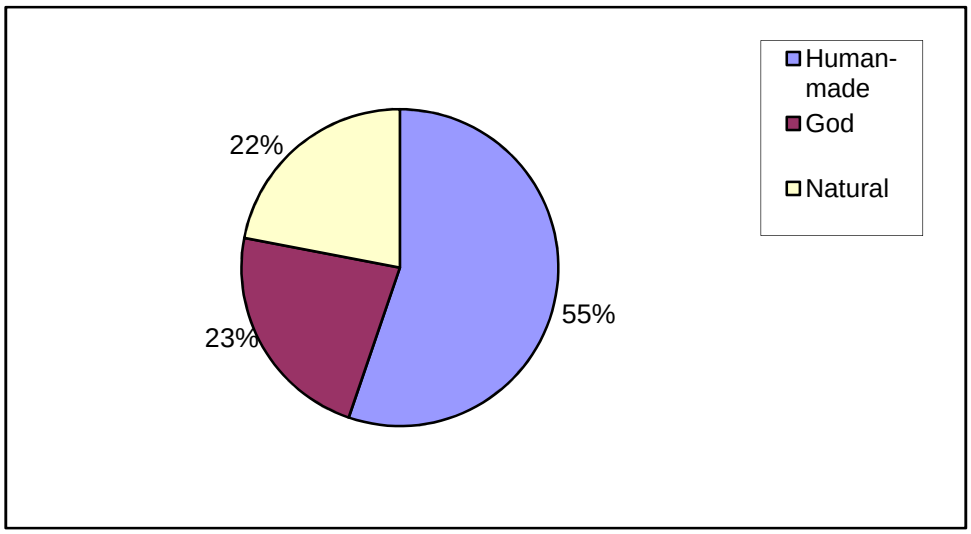

Figure 4.3: Perceived causes of climate variability

Table 4.3, presents human-made activities associated with climate variability as given by the respondents. Most (69%) of the respondents stated that cutting down trees for building purposes as well as clearing bushes to pave way for settlement and other economic activities had caused climate variation. This was elaborated in the FGDs when the participants agreed that in Isiolo County there used to be plenty of rain in the last 50 years ago. Thus participants in one FGD were in consensus with the following statement.

*Isiolo County used to be evergreen with many trees and vegetation.There used to be plenty of forage for our livestock, with many trees of different types. Today the trees are no more; they have been cut down and many buildings have been established. You cannot say that there has been vegetation in this region in the past. This has paved way for violent storms in this area.***(FGD, Kambi Mbule)**

This finding is consistent with the IPCC (2002:3) report which indicates that humans have caused many changes on the planet through land use changes by clearing trees which are valuable carbon sinks, to make room for urban developments, human settlement and agricultural activities. By removing these valuable carbon sinks global warming is being hastened.

Other respondents(13%) indicated that climate variability was caused by industrialization although they had limited knowledge of the relationship between the two. About eleven per cent of themgave over-population as a human-made factor leading to climate variability, while 7% of attributed it to over-grazing. According to this last group, it is culturally appropriate for pastoralists to keep large numbers of livestock. However, large herds of cattle are very destructive to the environment as the existing resources are exposed to intensive grazing for extended periods of time or without sufficient recovery periods. This has reduced the usefulness, productivity and biodiversity of the land and is one of the causes of desertification and erosion.

Table 4.3: Human-made factors associated with cause of climate variability

Human-made factors	**Frequency**	**Percentage**
Cutting down trees	152	69.0
Industrialization	28	13.0
Over-population	24	11.0
Over-grazing	16	7.0
Total	**220**	**100**

The respondents who stated that God had caused climate variability gave various reasons asshown in Table 4.4, with 57.6%of them stating that God had the power to do what pleased him.On the other hand, 34.7% of the respondents were of the opinion that God was punishing them for their sins. According to them, God was angry with the pastoral communities of Isiolo County as they kept on fighting, killing and raiding each other. The punishment was in the form of heavy rains such as the *El Niño*rains of 1997/1998 that were followed by spells of droughts. They said that they had had droughts for three consecutiveyears, that is, from 2009 to October 2011. According to them the heavy rains had killed their livestock, their major source of livelihood, and those which remained were killed by droughts. Hence, their livestock never had a chance of recovering. Lastly, a small number (7.7%) of the respondents stated that God was testing their faith.

Table 4.4: Reasons given for God causing climate variability

Reason	Frequency	Percentage
God's power	53	57.6
God's punishment	32	34.7
God's testing	7	7.7
Total	**92**	**100**

Human beings tend to link God to questions which are beyond their explanation. For instance, weather-related disasters have often been considered as "acts of God". In desperate tones focus group discussants stated that climate variability is God's doing and that it was not possible to go against God's will. They were therefore in agreement with this statement that says that: "*God created everything that exists, He brings rains, and he causes droughts. He is in control of everything and he has the solution to our problem."* **(FGD, Kambi Odha).**

Associating God with disasters is not limited to the Borana pastoralists. Eriksen and Marin's (2011:25) study among Ethiopians also found that unfavourable events and changes were explained as being caused by local people's sins. They gave examples of sins such as gossip, clan discrimination, adultery, stealing of livestock, chewing of *khat*, dishonesty and lack of loyalty. The study by Eriksen and Marin (2011:25) indicates that most Ethiopians associated severe weather changes with the divine act of retribution for their sins against moral customs. However, this association of God with climate variability is inconsistent with scientific views and could hinder the adoption of scientific supported mitigation measures to reduce the negative

effects of climate variability. People might prefer to pray about it and leave the issue of future happenings to God as they might feel that adopting the interventions might be going against the will of God. On the other hand, those who held the view that climate variability was caused by human factors and nature would probably adopt any mitigation measures available. This inappropriate orientation in knowledge would render the adoption of the introduced adaptive strategies a difficult task. This is because individuals within the community would have different views on strategies relating to mitigation measures against the negative effects of droughts.

Climate variability was also associated with natural factors. Most (65%) of the respondents indicated that it could be due to the fact that Isiolo is in the arid and semi-arid region.On the other hand 34% stated of the respondentsindicated that climate variation is a common occurrence in the range lands. Lastly, one respondents did not give any explanation.

Focus group discussants and the key informants stated that climate variability occur, naturally since Isiolo is located in the arid lands. According to them drought and climate variation is a natural calamity which has been occurring since time immemorial. Key informants indicated that the movement of the planet and eclipses of the moon and the sun might have played a big role in climate variation causing severe drought. Although they lacked scientific explanation for this their observation is in agreement with that of Khandekar (2010)which indicates that the effects of variations in the Earth's position to the sun contribute to natural climate change. According toKhandekar (2010) in the course of the year, the Earth changes its tilt so that its north end is towards the Sun for roughly half the year and the south end is towards the Sun for the other half, causing seasonal climate variation. The axis, or the line on which the Earth tilts

and rotates, also changes very slightly over time to put some areas of the Earth in more direct sunlight than others. Additionally, the Earth's orbit changes throughout the year, so that it is closer to the Sun and its heat at some points of the year than at others. All these changes cause climate variations leading to severe droughts. According to Amber (2009:1) natural variability refers to naturally-occurring fluctuations or events that change the Earth's climate on time scales ranging from years to decades. Big volcanic eruptions, for instance, can cause cooling that lasts for several years. When a volcano erupts, it blasts dust into the upper atmosphere where it reflects sunlight and cools the planet, a bit like a natural umbrella.

4.4 Perceived indicators of climate variability

On the question of the indicators of climate variability, most (70%) of therespondents observed that there were frequent droughts which lasted for many months. Other indicators were *El Niño* rains combined with floods which had 25% responses. The lowest ranked indicator (5%) was frequent storms. The respondents indicated that storms occurred mainly when there were droughts and that they were usually very severe, as they destroyed buildings and trees. The results are as shown in Figure 4.4.

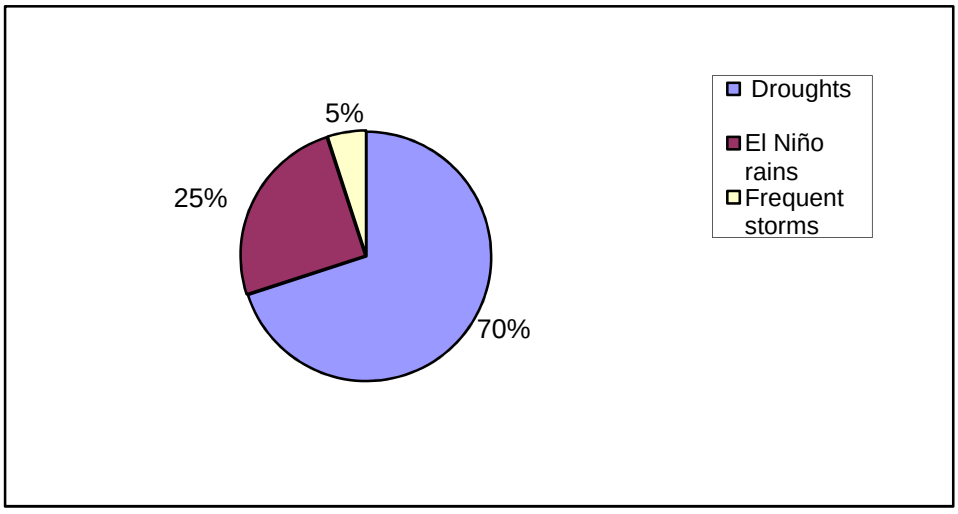

Figure 4.4: Perceived indicators of climate variation

The existence of storms in Isiolo is contained in a statement made below by one woman who had experienced suffering as a result of violent storms:

> *Look at my house, severe storms blew off the roof, it was fixed but I am not even sure how long it will take. We are suffering as a result of these storms which are frequent and violent, because when they are very destructive.***(Key informant, Kambi Mbule)**

4.5 Duration after which climate variability indicators occurred

4.5.1 Droughts

It was also important to know how long it took the indicators mentioned above to occur. About a third (32.3%) of the respondents stated that droughts occurred yearly, 24.2% said that it occurred after 1 to 2 years, while 29.2% stated that it occurred after 2 to 3 years. On the other hand, 5.7% of the respondents said that droughts occurred after 3 to 4 years. The results are as shown in Table 4.5.

Table 4.5: Duration after which droughts occur

Duration (years)	**Frequency**	**Percentage**
Yearly	130	32.3
1-2	97	24.2
2-3	117	29.3
3-4	23	5.7
4-5	16	4.0
5-6	4	1.0
6-7	7	1.8
7-8	1	0.3
8-9	2	0.6
9-10	3	0.8
Total	**400**	**100**

Participants in one focus group were all in consensus with the following statement:

> *For the past 20 years there has been variation in climate. We have been experiencing many droughts than it used to be before. Before droughts used to occur after 10 years but these days droughts have become very common. They can occur after two or three years. For instance, in this area we have had droughts for three years without any break, that is, from 2009 to October 2011. The type of droughts which occur nowadays are very severe, they also take more months than those which used to occur in the past.* ***(FGDs, Kambi Odha and Mbule).***

FGD discussants elaborated the aforementioned further by giving the trend of droughts for a period of 50 years as shown below:

- In 1959 there was a severe drought of cassava
- In 1966 there was a drought
- In 1973 there was a severe drought
- In 1984 there was a severe drought and people ate yellow maize
- In 1999 there was a drought
- In 2000 there was a drought and so many livestock died
- In 2003 – 2004 there was a drought
- In 2005 – 2006 there was a drought and it killed many livestock
- In 2009-2011 there was a drought

This information seems to support Kaitho's and Gatarwa's (2006:2) contention that drought occurrence has become more frequent than it used to be as it now occurs after 3 years and sometimes yearly instead of after 10 years as was the case in the past. A key informant had a similar observation that drought occurrence has shortened and had this to say: "*Previously, drought came every 8 years and it was something we knew and prepared for, but now the drought season is long and is here almost every year."***(Key informant, Elder Kambi Mbule)**

4.5.2 Floods

As shown in Table 4.6 a majority (58%) of the respondents indicated that floods occurred whenever there was rain in the study area.About 17% of the respondents said that floods used to occur after 1 to 2 years, while 4% stated that it used to occur after 2 to 3 years. However, 3 to 4 years were mentioned by 2%, 4 to 5 years by 1.3%, 5 to 6 years 9.3%, 6 to 7 years 1.5%, 7 to 8 years 0.8% 8 to 9 years 0.8% and 9 to 10 years 1%. Conversely, 10 to 11 years had 0.5%, followed by 11 to 12 years with 0.8% and 3% stating that floods used to occur after 12 to 13 years.

Table 4.6: Duration after which floods occur

Duration (in years)	**Frequency**	**Percentage**
Every rainy season	232	58.0
1-2	68	17.0
2-3	16	4.0
3-4	8	2.0
4-5	5	1.3
5-6	38	9.3
6-7	6	1.5
7-8	3	0.8
8-9	3	0.8
9-10	4	1.0
10-11	2	0.5
11-12	3	0.8
12-13	12	3.0
Total	**400**	**100**

This was also supported by a key informant who had this to say:

> *Rainfall has become very un-reliable. Sometimes it rains when we least expect it. There are times it rains very heavily with hail storms as though a door has been opened for it. It can rain for a day or two and then it stops, causing violent flush floods which destroy*

*buildings and plants. Fifty years ago our climate used to be predictable unlike today when things have changed.***(Key informant, Elder,Kambi Odha).**

4.5. 3 The El Niño phenomenon

More than two-thirds (65%) of therespondents stated that the *El Niño* phenomenon occurred after 14 years. They were referring to the 1997/1998*El Niño* rains. About a third (29.2%) of therespondentssaid that it occurred after 10 years. This was followed by 4.3% who indicated that it occurred after 5 years while 1.5% said that it took place after 2 years. Table 4.7 summarises these responses.

Table 4.7: Duration after which the *El Niño*phenomenonoccurs

Duration (in years)	**Frequency**	**Percentage**
After 2 years	6	1.5
After 5 years	17	4.3
After 10 years	117	29.2
After 14 years	260	65.0
Total	**400**	**100**

The two FGDs werein agreementthat*El Niño* rainswere not very common. They gave a trend of the *El Niño* phenomenon's occurrence from 1990. According to the participants, therewere *El Niño* rains in 1997/1998, 2002and in 2006. One of the key informants who had suffered during the *El Niño* rains of 1997/1998 stated that *El Niño* rains are not frequent but when they appear they are usually very destructive since they destroy bridges, buildings and make roads impassable.Boru, a 50- year old man, described howthe *El Niño* floods of 1997/1998 affected him.

I used to work as a waiter in a guest lodge in Samburu County, but now am not working since the El Niño rains caused severe floods which destroyed the hotel where I was working, even my belongings were destroyed by the floods. I came back with nothing. I have tried to look for a job without getting any. I have approached many organizations such as EDA for assistance, but havenot received any. **(Key informant, Kambe Mbule)**

4.6 Early warning signs of normal rain and floods

4.6.1 Early warning signs of normal rain and floods

Various signs were used by the community to predict the onset of rains (see 4.5). For example, about half (53%) of the respondents stated that they observed the pattern of seven stars. According to them these stars formed a particular pattern which showed whether it would rain or not. The location of the stars was also an indicator of the amount of rain and how soon it would rain. This was supported by focus group discussions and key informants. On the other hand, about a third (31%) of the respondents said that some trees produce flowers before it rains. They gave examples of *Acacia nilotica,Acacia tortillas* and *Baranitesaegyptica*.Participants in one focus group discussiongave similar information as evidenced by the following statement: "*A few days before the onset of the rains, Acacia trees start flowering. They also become very green*" **(FGD participants, Kambi Odha)**.This is in agreement with Njiro's (1994:96) work among the Atharaka whichindicated that the flowering of certain plants known by elders, the behaviour of birds, and the croaking of frogs were interpreted as early warning signs of rains. In addition, Musembi's (2010:3) work in the Akamba community also indicated that they have early warning signs of rains which include flowering of certain plants, presence of insects such as crickets, and movements of birds. According to Musembi (2010:3), indicators of the onset of rainfall are used for planning farming activities. UNEP (2007) also states that the Banyala of Budalang'i on the

shores of Lake Victoria had early warning signs before the onset of floods. In its report, it observes that these people believed that when crocodiles started laying their eggs on river banks on higher ground, it was a sign of impending floods. Another 16% of the respondents stated that through observation of some birds' movement and the sound made was an indication that the rains were about to start. The local names for these birds are *bararatu*, *buriya*, *urudhudhe* and *lakab***.**Figure 4.5summarises these responses.

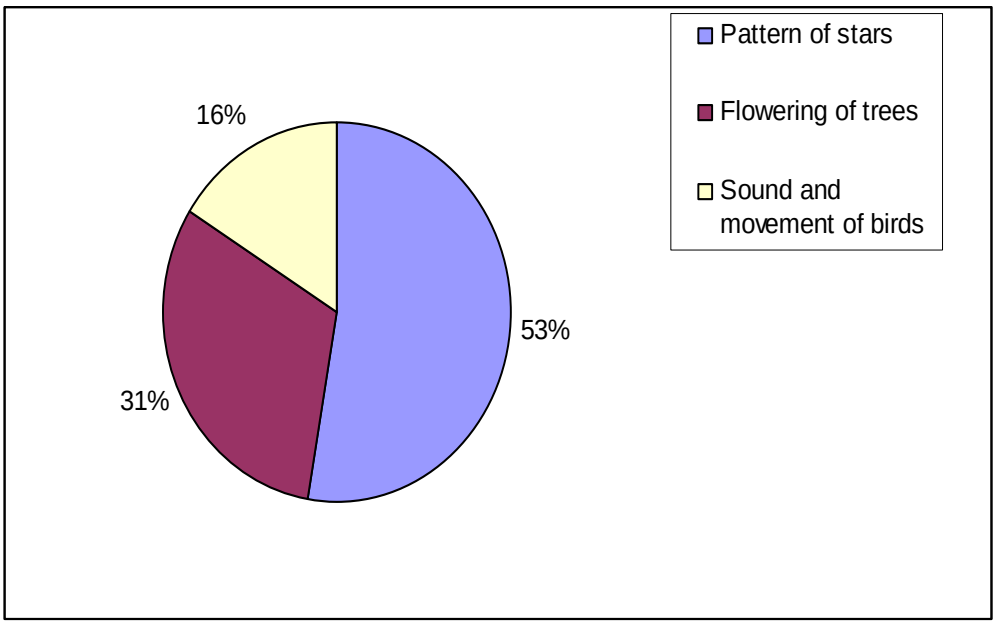

Figure 4.5: Perceived signs of normal rain

During the focus group discussions other signs were given as indicators of normal rains. The discussants stated that a few days before the onset of rains domestic animals would refuse to enter their sheds and this behaviour was interpreted to mean that it had rained heavily and the shed is flooded. Key informants supported the information given by the focus groups. According to one of them: "*Before the coming of the rains bulls become very playful and jovial. Cattle begin to*

shake their rear legs, as if in anticipation of mud being removed, when it rains." **(Key informant, Livestock officer)**

Another sign was that a few days before it rained, livestock would refuse to get up unless forced to do so. Focus group discussions also revealed that elders could tell if it would rain by observing the intestines of slaughtered animals and if their colour was red that was an indication that it would start to rain. Similarly, various signs were given by respondents as indicators of floods. Some of the signs were similar to those of normal rains such as flowering of trees, the pattern of stars, and the movement of certain birds and the noise they made. In addition, there were signssuch as increased presence of crickets, butterflies and other insects.

4.6. 2 Early warning signs of droughts

Various signs were given as early warnings of droughts as shown in Figure 4.6 below. About two-fifths (41%) of the respondents said that elders observed the intestines of a slaughtered animal and if their colour was black that was an indication that there would be a drought or war. Sixteen per cent of therespondents stated that before the onset of a drought temperature become extremely hot, 15% said that some trees shed their leaves, 12% talked of the sounds and movements made by some birds, while 11.5% gave the location of starsin the sky. Lastly, 4.5% of the respondents said that by observing the sky their people would be able to predict whether there would be drought or not. For instance, if the sky was very clear without clouds it was an indication that there would be drought. Figure 4.6 gives a summary of the responses.

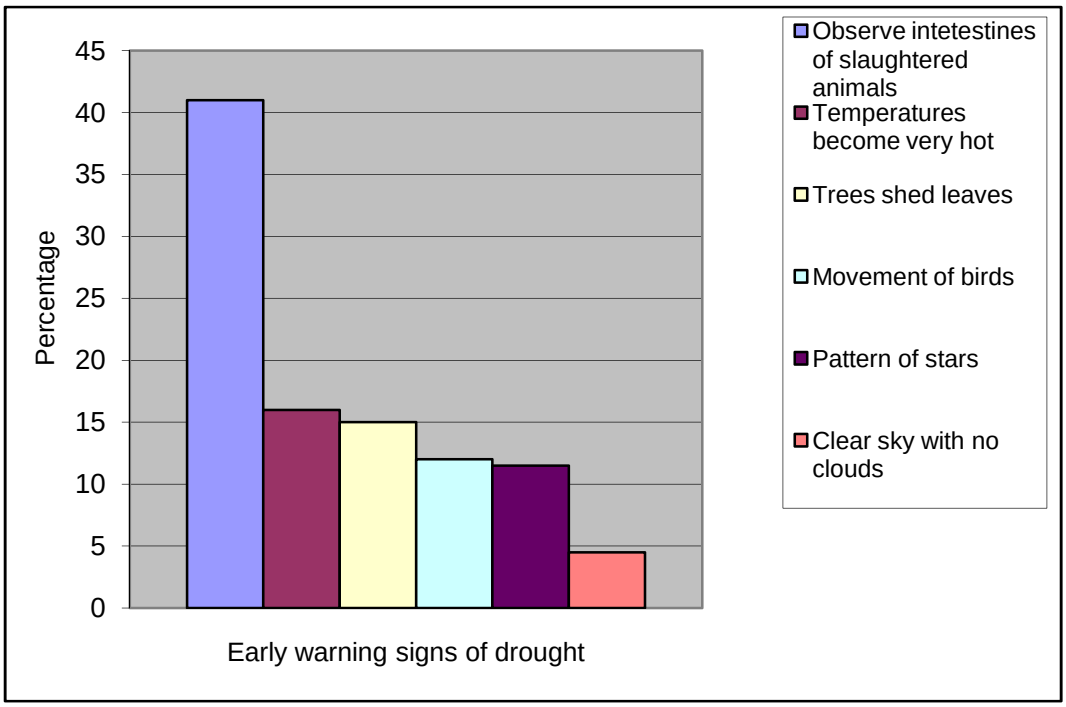

Figure4.6: Perceived early warning signs of droughts

There was consensus among the FGD participants on the behaviour of domestic animals before the coming of a drought. According to them:

> *Before the coming of a drought, female camels stand and cross their rear legs, urinating on their thighs, on their return to the boma in the evening. This is an indication that there will be no water in their locality and that they will migrate long distances.* **(FGD, Kambi Odha)**

Focus group participants of Kambi Mbule were also in agreement with the behaviour of livestock as an indicator of drought.According to them:

> *Before drought sets inanimals are restless in the boma, neither sleeping nor sitting. When they go for grazing and browsing they are usually unsettled anddisappear in pairs to the bush and stay there until sunset.* **(FGD, Kambi Odha)**

One key informant had this to say on the behaviour of domestic animals: *"Before the onset of drought, cattle and camels walk in a lazy way, sitting after drinking water and are reluctant to leave the water points."* **(Key informant, Isiolo).**

Indigenous early warning signs of weather changes using the behaviour of animals, birds and plants were also observed by Pratt (2001:28) in the Somali community of northern Kenya. According to his study, the coming of a drought among the Somali is depicted by female camels' urinating while sitting, which is interpreted to express hopelessness for the future.

4.7 Reliability of the early warning signs

On whether the early warning signs were reliable or not, most of the respondents (74.8%) stated that they were reliable, while 14.3% indicated that they used to be reliable only in the olden days. Focus group discussions suggested that the early warning signs used by the Borana were very reliable. They said that they have relied on their indigenous forecasting methods to predict impending seasonal events since time immemorial. According to the discussants, there were village elders (*wazee)* who were consulted and they warned the community of any impending calamities such as droughts, floods and wars.

Focus group participants stated that the early warningsystems were based on three precepts. First, pastoralists must have had detailed knowledge of various seasons in a year. Second, pastoralists needed to know how to interpret the behaviour of animals and plants, which serve as valuable indicators of subtle fluctuations in temperature and humidity. Third,observed historical trends allowed for reasonable predictions of future weather patterns. However, the discussants

also stated that the increasing climate variability, severity and frequency over the last decade render indigenous forecasting methods less reliable than they used to be in the past. This supports Pratt's (2002: 18) observation that although traditional early warning systems and coping strategies employed by pastoralists inNorth-Eastern Kenya in anticipation and response to drought are rich in their diversity, the increasing severity and frequency of drought over the last decade has rendered this latter form of forecasting less reliable than it was in the past.

However, 11% of the respondents said that the early warning signs were not reliable. Some of these respondents added that their religion was opposed to observing the stars.Nevertheless, almost all (99.8%) the respondents agreed that there has been temperature variation in the last 20 years.Focus group discussants were in full support of this information, and observed that:

> *When they were growing up the weather was moderate. They never experienced very high temperatures that they are witnessing today. The heat from the sun has increased greatly causing rivers drying rivers and vegetation to dry.***(FGD, Kambi Odha)**

4.8 Sources of information on climate variability

It was also important to know how the Borana pastoral community acquired information about weather variation. This is because access to climate forecast information has potential to reduce the impacts of climate variability and thus enhance the adaptive capacities of the respondents. A majority (60%) of therespondents stated that they got their information from the radio and television, 27% from elders, 7.5% from other pastoralists, 2.5% from religious leaders, 1.5% from chief's meetings and 1% from the Meteorological Department. Figure 4.7 gives a summary of the responses.

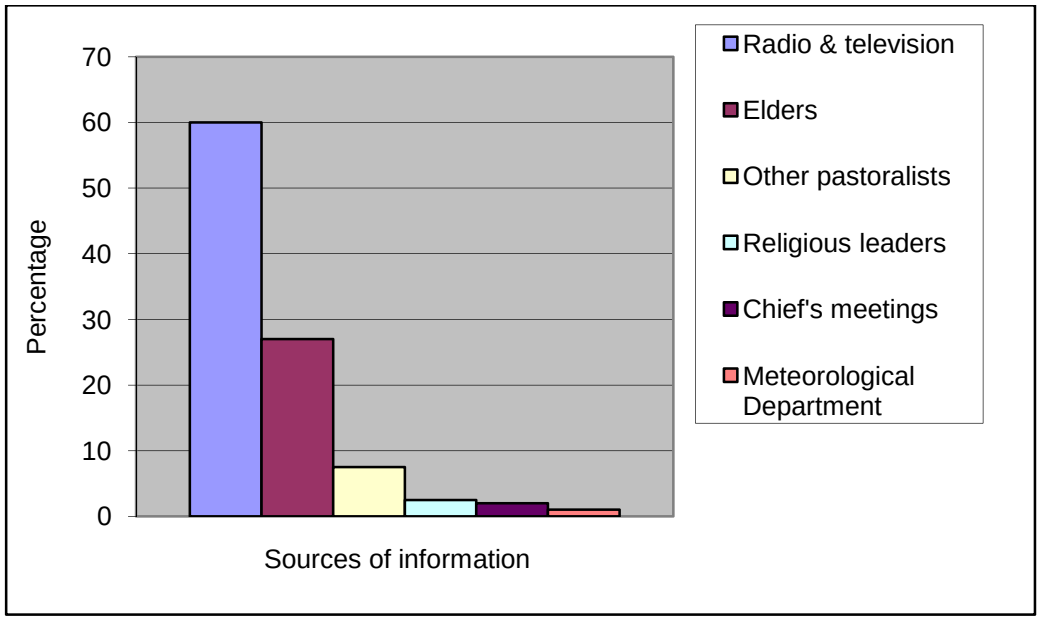

Figure 4.7: Respondents sources of information on climate variability

On preferred sources of information various channels were given: the radio and television had the highest with 38.5%, followed by elders (*ragas*) with 28.5%, other pastoralists (16%) religious leaders (3%) and the Meteorological Department (0.5%). These findings indicate that the radio and television are the most used and preferred mode of communication channels on information on climate variability. Nonetheless, it was surprising that none of therespondents mentioned government extension officers as sources of information despite the current structure of forecast dissemination through the ASALs Departments Special Programmes of the Ministry of Agriculture and Office of the President (Recha,2011: 24). Extension officers offer a better opportunity to accurately interpret forecasts to farmers during their field visits. Their absence in disseminating climate forecast can be attributed to not prioritizing forecasting and instead engaging themselves in other programmes.The Meteorological Department had a low number of respondents as compared to the other communication channels.

CHAPTER FIVE

EFFECTS OF CLIMATE VARIABILTY ON THE LIVELIHOODS OF THE BORANA

5.1 Introduction

This chapter presents study findings onhowdroughthas affected the livelihoods of the sample population. It focuses on their socio–economic well-being,theenvironment, eating habits, food security, housing styles, alternative sources of livelihood, livestock and human health, as well as gender-based roles.

5.2 Effects on the socio–economic well-being of the Borana

The study findings indicate that climate variability has affected the livelihood of the Borana to a great extent.This is because asked as towhether climate variability has affected the social and economic status of the community almost all the respondents (99.8%) answered in the affirmative. The respondents said that their wellbeing has been affected in three ways as shown in Figure 5.1.

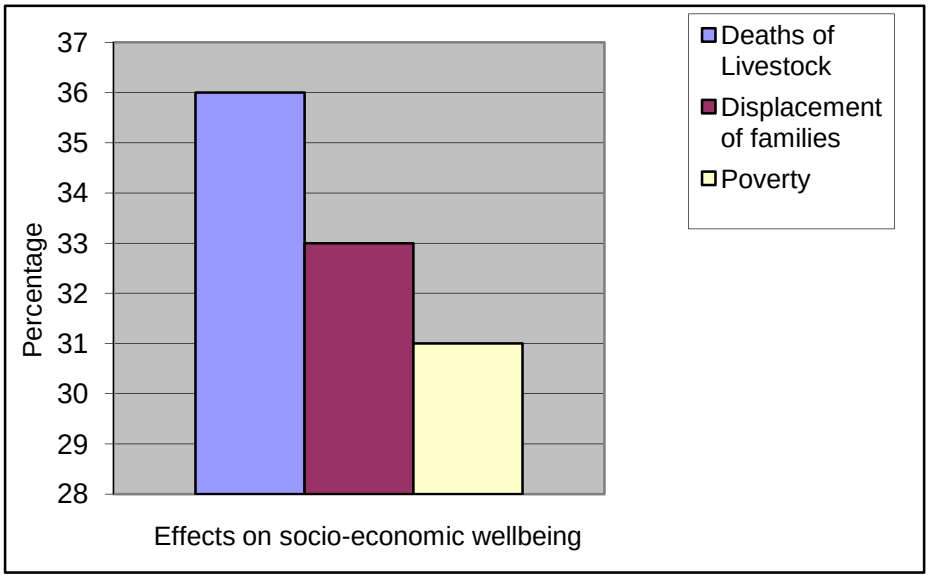

Figure 5.1: Effect of climate variability on the socio–economic well-being of respondents

Thirty-six per cent of the respondents stated that climate variability had contributed to the death of livestock, which is the major economic activity of the community. Droughts had caused fluctuations in the livestock population through increased mortality and reduced birth rates due to decreased forage and water availability.At the time of this fieldwork in 2011, one elder had lost most of his livestock due to droughts. This is what he had to say about his experience:

> *I learnt livestock keeping from my parents and I have been doing it since I was a child. In those days, there was grass all over. But over the years, everything has changed. There is no more grass for our livestock. The little rain that falls in this area has become less frequent and sometimes it does not rain at all. Even when we move to new pastures, grass is increasingly hard to find. This change of the weather has an effect on our livelihoods. Twenty years ago, we had more than 150 cattle; today, there are just4 left. I am very concerned about this because for us cattle are very important.* (**A 68-year Male, Kambi Garba)**

Pastoralists tend to reduce their livestock numbers during droughts out of desperation and to provide food for their families. Unfortunately, during droughts livestock become emaciated and do not attract competitive bids because buyers do not wish to take risks.Focus group discussants suggestedthat selling of livestock by the pastoralists was taken as the last option when the livestock was on the verge of death and, thus, were offered a highly discounted price for it.However, a key informant stated that the prices given to pastoralists for their livestock during drought were very poor, some community members were not willing to sell theirs and they preferred to let them die. This is how the informant put it:

During the time of droughts, pastoralists are forced to sell their livestock at very cheap prices because they sell them when they are about to die. Even the Kenya Meat Commission comes to buy livestock when they are emaciated. They donot see the use of taking them to the slaughter house in Nairobi because they can all die on the way. They prefer slaughtering and giving them to the community to eat. They would die before reaching Nairobi. **(Keyinformant, Ministry ofLivestock)**

Thirty-three per cent of the respondents stated that climate variability brought displacements as people moved with their livestock in search of water and pasture. The respondents argued that frequent droughts forced able-bodied men to move with their livestock for many months leaving women, the elderly and children behind. In some cases this causes family breakdowns since some of the women engage in immorality so as to get finances to feed the remaining family members. The loss of livestock is the greatest reason for the settlement of ex-pastoralists around shopping centres. It also causes an accelerated rural-urban migration as people who have lost all their livestock have moved to towns such as Isiolo, Nanyuki, Nairobi and Thika in search of jobs such as hotel attendants and watchmen. According to focus group discussants, the movement of women into urban areas was rare in the past but today pastoral women have settled in urban areas in great numbers. This isconsistent with an Oxfam GB (2010:18)studywhich indicates that rural-to-urban migration has become rampant among pastoral communities.This pattern involves the migration of pastoralist households or individuals from pastoralist districts to other pastoralist districts or, more often, to urban centres. Oxfam GB (2010:18) gives an example of the Maasai men who have migrated to urban centres to take up wage-earning jobs and offer specific skills in niche employment sectors such as security services. The aforementioned facts indicate that

climate variability has led to displacement of pastoral communities. This was supported by focus group participants and some key informants.

Lastly, 31% of therespondents stated that poverty had become rampant in the Borana community. This argument was supported by focus group discussants who said that massive losses of livestock drove off large numbers of pastoralists from the pastoral system, which was their major source of livelihood. According to a group discussion at Kambi Mbule:

> *One of us here started livestock keeping when he was young, about 20 years old. He had large herds of cattle, goats and sheep. Droughts killed almost all of the livestock he had. The ones which remained he thought he would use them to rebuild a herd during the rainy season, but unfortunately they were all carriedoff by the Turkana who are our enemies. He has no livestock left and depends on relief food from the government and other organizations. His life has changed from riches to poverty. For him, life will never be the same again.***(FGD, Kambi Mbule)**

According to the respondents, a pastoralist without animals hardly qualifies for the title of a pastoralist. This is because not only is he forced to depend on others for survival, but also he does not have the resources to fulfill traditional social requirements and to meet additional needs such as clothing and education for his children. This finding is in agreement withAdowa (2008:2) who reports that pastoralists who lost their livestock in Northern Eastern Kenya joined a group of ex-pastoralists surviving on food aid and begging.For pastoralists to lose their livestock is to lose their entitlements, which makes them vulnerable and valueless in the society since ownership of livestock defines their economic, social and political status.

5.3Effects on the environment

The findings of this study suggest that climate variability has affected the natural resources used by the Borana (Figure 5.2). This is because half (50%) of the respondents said that trees and grass had dried up, 30% stated that rivers and water pans had dried up, while 20% said that desertification had increased.

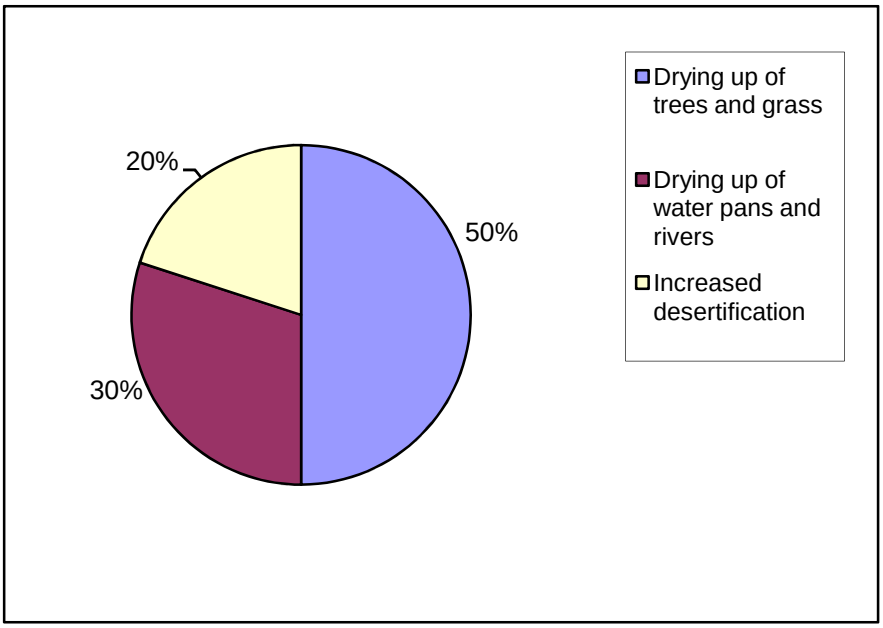

Figure 5.2: Observed effects of climate variability on environment

The livelihoods of the Borana largely rely on livestock which depends heavily on sensitive ecological systems. Severe and prolonged drought has led to the drying of water sources and changes in rainfall patterns, and this has contributed to the disappearance of certain forages and herbaceous plant species affecting the livelihoods of the Borana community. One key informant who was born and brought up in Isiolo County had this to say about environmental changes:

> *When I was growing up there was vegetation and grass just behind our homestead, there was plenty of trees in Isiolo County. But now everything has changed, all the trees have*

*been cut to pave way for buildings. Today our wives and children have to walk long distances to get fire wood.***(Key informant, Kamba Garba)**

Another key informant (a forest officer) made a similar observation that climate variability had affected the environment of Isiolo County.He said:

*People cut trees to get building materials. Poverty which has resulted from the death of livestock has led some of the ex-pastoralists to engage in charcoal burning.***(Key informant, Kenya Forest Service)**

The findings of this study similarly indicate frequent droughts and rainfall fluctuations in the study area and this has significantly affected the natural resources in the area. The natural capital of the Borana community is disappearing rapidly, as wells and rivers dry up and soil erosion becomes severe. According to GOK (2010:30) drought threatens to eradicate the rich flora and fauna of the ASALs which has been valuable for the nation. The livelihoods of the Borana are almost not sustainable as indicated by land degradation. This study indicates serious shocks to the livelihood system due to the changing climate. The changes have a profound effect on people's livelihood strategies. The implication is that the impact of climate variability on the livelihood system of the Borana people is a real challenge.

5.4 Effects on eating habitsand food security

It also came out clearly from the study that climate variability has brought about changes in the eating habits of the Borana community. In the past these people used to rely on meat and milk as their staple foods, but the study findings indicate that today they eat other types of food instead of meat. Figure 5.3 shows that 39.2% of the respondents eat a mixture of maize and beans, 27%

eat vegetables, 23.2% eat rice, chapati and *ugali*, while 10.6% stated that they eat meat and teff. Field observation revealed that in most homes a mixture of maize and beans, commonly known as *githeri,* is eaten.

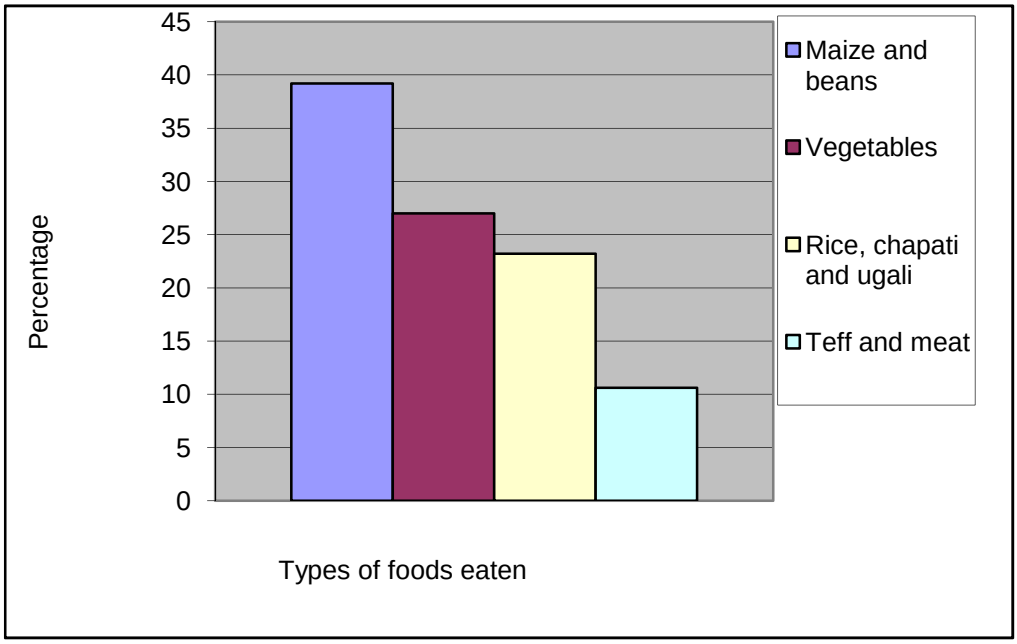

Figure 5.3: Types of foods eaten

Key informants were in consensus relating to the changes of eating habits of the Borana. One of them, a village elder who migrated from Nyeri County, made this observation:

> *I have been in Isiolo County since 1973. During that time the Borana community was self-reliant eating meat, and drinking milk and blood. Today most of the members have become poor due to frequent droughts which have contributed to the deaths of livestock. These days they depend on relieffood. They eat cereals and vegetables. In the olden days the community used to equate vegetables with grass, food meant for livestock.***(Key informant, village elder Kambi Odha)**

Another key informant who was born in Isiolo County had this to say about the change in eating habits:

> *These days we eat maize and beans; we have become very poor and we do not have any choice, we eat what is available. Sometimes we are not able to buy those maize and beans because the prices go up whenever there is a slight drought*. **(Key informant, village elder, Kambi Mbule)**

On whether there has been change in food security in the Borana community, slightly over half (52.5%) of the respondents stated that due to recurrentdrought their livestock had died en mass and that many families relied on relief food. Although relief food was not a desired option, many respondents reported that helplessness during and after droughts left them mainly dependent on it for survival.Extended droughts have become common in this region leading to the death of livestock andmaking many people suffer, especially children and breast-feeding mothers who used to rely on dairy products. Otherrespondents (27%) said that food had decreased and that the food which was available was too expensive for un-employed persons. About one-fifth (20.5%) stated that food had become very scarce and of poor quality unlike their traditional food. According to information gathered from focus group discussions, *githeri*has become very common for all, including young children. The reason they gave for this was that drought has contributed to diminished cow nutrition due to reduced forage production which, in turn, has led to reduced daily milk off-take. Furthermore, livestock movement has also led to milk shortage. Field observation revealed that in most of the householdstea without milk was being taken. Focus group discussants stated that the relief food given by the government was in the form of maize and cooking oil, which are given in inadequate amounts. As a result of this, people had

adopted maize meal as their main diet. Focus group discussions furtherrevealed that some diseases attributed to vitamin deficiency such as kwashiorkor and malnutrition among children had become rampant in the study area.Depending on relief food given by the government, NGOs and faith-based organizations was another indicator of food insecurity, other indicators of food insecurity included reduced quality and quantity of food and frequency of meals for the young and adults. These study findings are in agreement with the report by Ziervogel et al. (2006) which states thatclimate variability and change are majorthreats to food security in many regions of the developing world which are dependent on rain-fed agriculture. However, food insecurity resulting from climate variability is not only limited to the Borana community since IOM (2010:29) observed that among the Turkana climate variability has led to disruption of livelihoods, a decline in biodiversity and a shortage of food. Similarly, a study by Mwang`ombe et al. (2010:406) in Kibwezi found that over 95% of the farmers reported thatfood consumption at the household level was affected with 73% of them resorting to skipping meals. Livestock prices had also declined during the dry spell as most households decided to dispose off their livestock at the same time. Finally, the prices of milk and cereals had gone up due to scarcity.

5.5 Effects on building styles

This study also showed that climate variability had made the Borana community settle down compared to the past (Jillo et al., 2006:3) when they used to move with their livestock from one place to another. In the past, the community used to have traditional houses which were temporary and they could be dismantled and carried to their next destination. According to this study, however, the building styles of the Borana of Isiolo have changed completely. About half (49.5%) of the respondents had timber houses, followed by 36% who had mud houses while 14.5% had simple stone houses. Direct observation revealed that there were only a few

traditional houses which were used as kitchens but not as the main houses.The explanation given for the change of the building styles was that their traditional houses were not suitable for conditions of heavy rains, floods and storms caused by climate change. Figure 5.4 shows the types of houses constructed by the Borana community today.

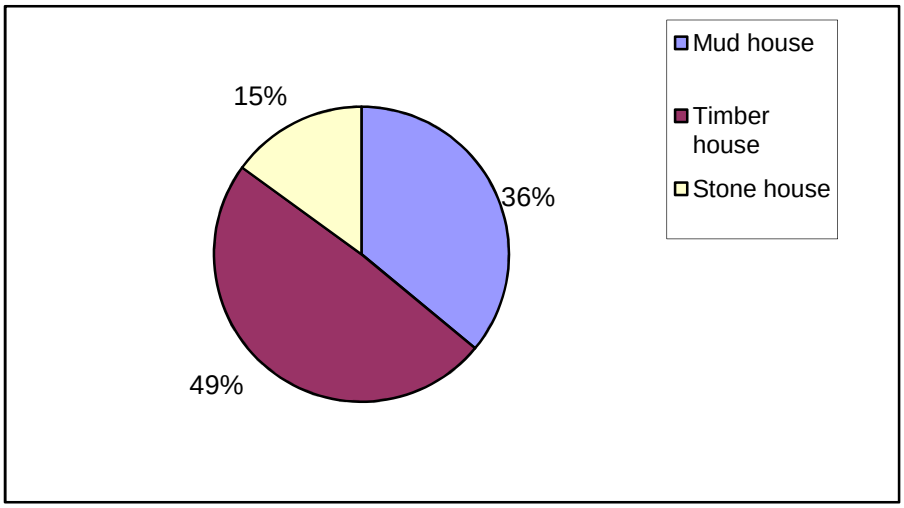

Figure 5.4: Types of houses owned by respondents

5.6 Alternative sources of livelihood

The studyfindingssuggest that climate variability has made the Borana community to diversify their livelihoods. Focus group participants stated that traditionally pastoralism was a full-time occupation and everyone from an early age was engaged. However, climate variability has made the communityto look for alternative ways of getting income. According to the results of this study, 33.3% of the respondents stated that they engaged in causal labour, 30.3% have turned to small-scale farming, while 24% engaged in small-scale business. Lastly, 12.5% of the respondents indicated that people had joined salaried employment. Figure 5.5 summarises the alternative livelihoods of the respondents.

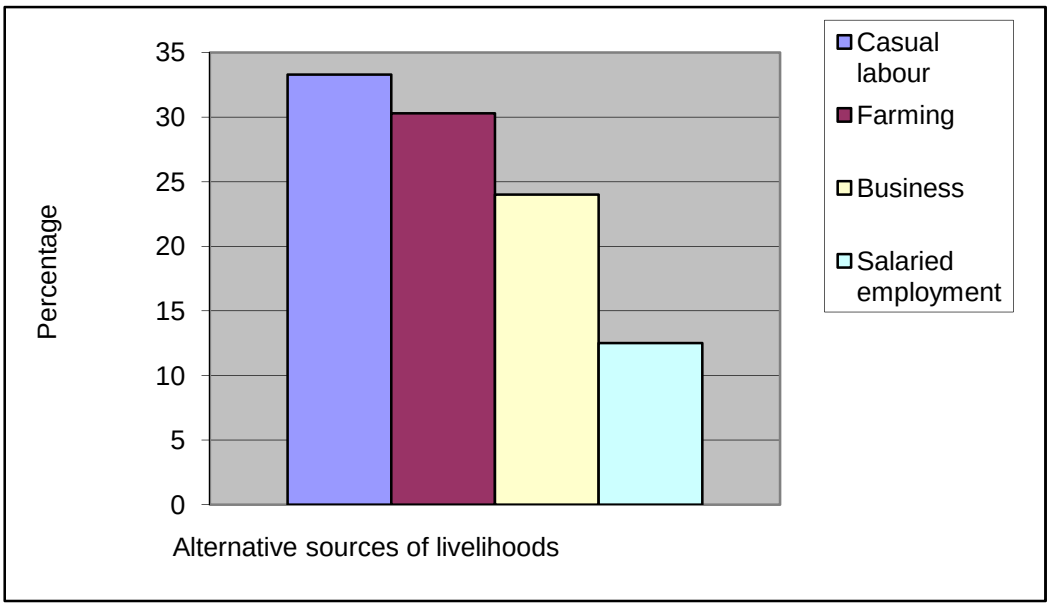

Figure 5.5: Alternative sources of the livelihoods of the respondents

Field observation revealed that many households had kitchen gardens while others were operating small kiosks.This finding suggests that due to the pressure brought about by climate variability, Borana pastoralists have sought alternative livelihoods outside the pastoral context in order to minimize its negative effects. Apart from salaried employment, which can be sustained, some of the activities which the Borana are engaged in are only for survival and are not sustainable. Examples include small-scale farming which is rain-fed and small businesses. An agro-pastoralistamong the Borana hardly cultivates 2 hectares of farmland per season, and productivity is poor due to the weather and poor agricultural practices.

This study indicates that even though livestock keeping was the most preferred source of livelihood among these pastoralists, there was increasing income diversification in thecommunity particularly as an immediate survival mechanism during and after drought

periods. Focus group discussants and key informants stated that many pastoralists are exiting from the traditional 'highly mobile' form of nomadism and entering into agro-pastoralism or sedentarisation and other livelihood options.Oxfam GB (2010:16) made similar observationsthatpastoralistswho have lost their livestock have been forced to settle near urban centres where they are diversifying their livelihoods. It also observes that settled pastoral households in the Horn of Africa have diversified their livelihoods, and some have embraced crop production, while others engage in commercial and craft activities. According to Oxfam GB (2010:17) some households send members of the family as labourers to towns or other regions, or even abroad (usually to Middle Eastern countries) to work and send remittances for household use. More and more households send children to school in the hope of improving their access to employment in the future, while other households move and settle close to food distribution centres to secure better access to food.

However, the study findings suggest that the alternative livelihoods strategies the Borana community is engaged in are only for survival and not for sustainable developments since the community has limited skills and capital to enable it have better gains.These alternative livelihood sources could be made sustainable by imparting those involved with the necessary skills required for small businesses and farming.Microfinance can indeed have positive impact, but it is not a solution for every situation since failure does occur. On the other hand, such a proposal might be opposed by pastoral communities who are Muslims and are against any financial institutions which charge intereston credits given to customers. Theother challenge would be how to implement grassroots microfinance services where the people are illiterate and

widely dispersed, and where access to conventional banking services to help backstop the process are limited.

5.7 Effects of climate variability on livestock and human health

This study revealed that many livestock diseases had become more common than they used to be before (Figure 5.6). Slightly more than half (53%) of therespondentsstated that there were new livestock diseases and gave Rift Valley Fever (RVF) and swollen glands (*Haemorrhagic septicaemia*) as examples. This argument was supported by focus group discussants and key informants who said that these two diseases are new for they have never been experienced before. According to them, Rift Valley fever was first reported in Isiolo County in late 2006. Ngeiywa et al. (2012:75) state that this disease is passed on to livestock by mosquitoes, which proliferate with the rains, especially when there is flooding. The disease affects livestock, wild ruminants and small rodents, and results in high death rates. The disease is also known to affect and kill humans, especially those in close contact with animals such as herders, butchers and veterinarians. Twenty-six per cent of therespondents said that diseases such as foot and mouth as well as foot rothad also become common. Similarly, 19% stated that *Contagious caprine pleuropneumonia*(CCPP) and *Contagious bovine pleuropneumonia*(CBPP) had become common during the time of the *El Niño* rains and the accompanying floods, while 2% mentioned *Tryposonomiasis* as having become common.

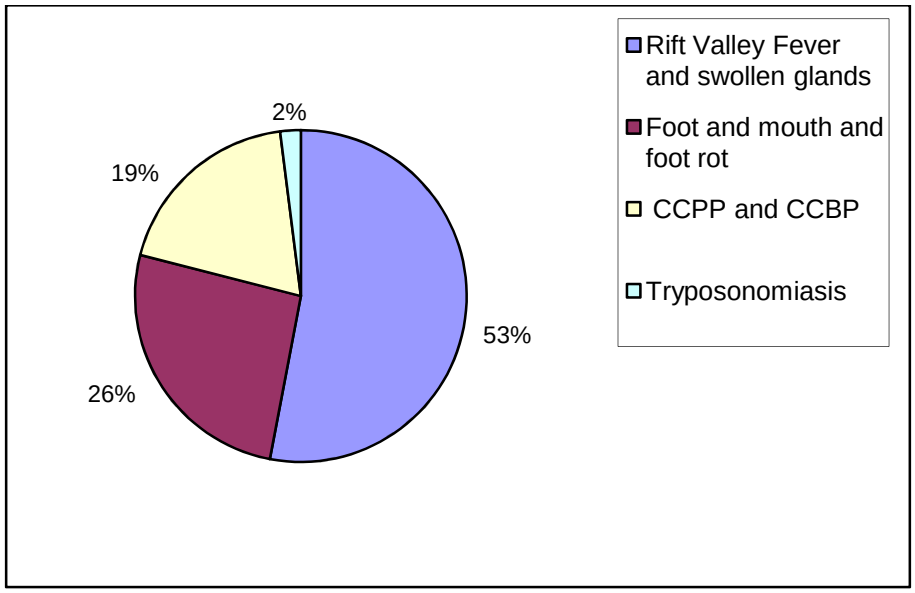

Figure 5.6: Livestock diseases associated with climate variability

Other diseases listed by focus group discussants included *Coenuriosis (Sirgo),Helminthesis, Camel pox,* and *Toxeamia*.This finding concurs with WISP's (2010:14) observations thatclimate variability may bring about substantial shifts in disease distribution, while outbreaks of severe diseases could occur in previously unexposed animal populations. It is worth pointing out that while livestock often has evolved genetic resistance to diseases to which they are commonly exposed, they may be highly susceptible to 'new diseases'. The appearance of new diseases and the spread of old ones among the surviving livestock is detrimental to the pastoralists. Livestock diseases pose a great threat to livestock as they lead to a closure of trade in animals and animal products locally and nationally. At the same time individual pastoralists use more funds to purchase drugs so as to treat their livestock.

This study also revealed that climate variability has led to increased human diseases. This finding concurs with that of IPCC (2007:48) which asserts that global changes in temperature

and precipitation may affect the incidence and range of several infectious diseases within endemic areas and their introduction to other areas.Calvosa et al. (2009: 2) indicate that direct effects of climate change, which include higher temperatures and changing rainfall patterns, could translate into an increased spread of existing vector-borne diseases and macro parasites, accompanied by the emergence and circulation of new diseases. In some areas, climate change could also generate new transmission models. Githeko and Woodward (2003:48) state that changes in climate mean temperatures would increase the transmission of infectious diseases and their geographical distribution. Tabachnick (2009:946) observes that climate is a major environmental driver influencing vector-borne disease epidemiology. This is because the climate influences various aspects of an arthropod vector's life cycle, including survival, arthropod population numbers, vector pathogen interactions, pathogen replication, vector behaviour and of course vector distribution.

The diseases given by the respondents include malaria, TB, HIV/AIDS, Rift Valley Fever, kwashiorkor and marasmus, pneumonia, typhoid, amoebiosis, fever, common cold, diarrhoea and dysentery.Figure 5.7 shows that more than a third (36%) of respondents said that malaria had become very common. Githeko and Woodward (2003:46)had made similar observation that climate change influences weather and climate sensitive diseases by increasing the populations of vectors such as mosquitoes.Other respondents (20%)gave TB and HIV/AIDS, while 21%stated that there were new diseases and gave an example of Rift Valley Fever. According to Field (2005:116), Rift Valley fever is a *zoonotic* disease which is passed from livestock to humans who come into contact with affected animal products. Twelve per cent of the respondentsindicated that diseases related to food deficiency (malnutrition) such as kwashiorkor

and marasmushad increased. Lastly, 11% of the respondents stated that pneumonia had become more rampant than it used to be before. Figure 5.7summarisesthe human diseases given.

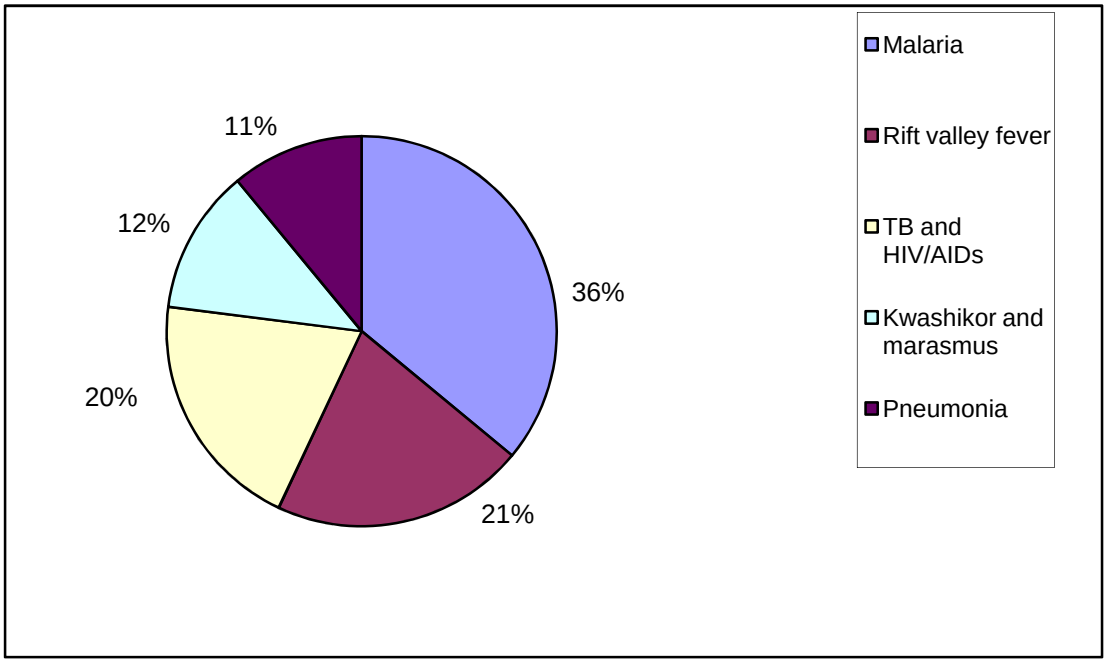

Figure 5.7: Human diseases associated with climate variability

Other diseases given by focus group discussants include typhoid, amoebiosis, fever, common cold, diarrhoea and dysentery.According to them water-borne diseases become common especially during the *El Niño* rains that often cause widespread flooding. Key informants were in agreement with the observations made by focus group discussants. As one female informant put it:

> *Diseases have increased in this locality. It is very hard to go to a homestead and fail to get a person suffering from any of these diseases such as malaria, typhoid and amoebiosis. They have become very common these days. Other problems related to*

*inadequate foods have become prevalent especially among the growing children.***(Key informant, Ministry of Agriculture)**

Human susceptibility to infections might be further compounded by malnutrition due to severe drought tress on livestock production. All these diseases compounded the negative effects of drought on the pastoralists because when a household member is sick the quality of available household labour is seriously compromised and household resources are spent on health rather than on development.

5.8 Effects of droughton gender-based roles

The findings of this study revealed that climate variability have affected gender-based roles in a great way as they have to an emergence of non-pastoral income-generating activities. About two-fifths (39.8%) of the respondents stated that men and women fetched water, a role which culturally used to be reserved for women. The reason given for this is that with climate variability water has become scarce in the region and to get it people walk long distances and, thus,there isa need to assist each other. On the other hand, 32.3% of therespondents said that men had adopted the role of building houses. Among the Borana, women used to build traditional houses but the study revealed that the type of houses constructed to cope with climate variability were labour intensive and also required special skills which women did not have. About twenty-two per cent (22.3%) of the respondents said that women engaged in small-scale businesses unlike in the past when they used to feed calves and lambs. Lastly, 5.8% of therespondents observed that women are engaged in small-scale farming.

Traditionally, the Borana community had well defined-roles and duties for every member of the community. According to Nyamongo (2000: 61) the division of labour was based on age and sex and every member of the community made vital contributions towards the continuation and adaptation of pastoral systems. The males were economically productive when they were still youthful, energetic, agile and could move fast and far over the difficult terrain as herders, scouts and warriors. Middle-aged men looked after livestock while women and children used to take care of small ruminants and sick animals. They also used to water family herds and prepare family foods. According to Kipuri and Ridgewell (2008:7), until recently, the roles of men had tended to remain much more restricted to livestock production and often included caring for and migrating with herds, managing grazing and water resources, livestock trading, controlling predators, ensuring security and providing raiding parties. However, in recent years the labour of men has shifted, with their growing involvement in non-pastoralist activities. This has occurred as a result of calamities such as drought and floods, which has contributed to the death of livestock and as a result some members of the community have been left with nothing to do other than to look for alternative ways of getting income. This has led to rural-urban migration becoming very common among the youth from the study area.They move to urban areas where they get employment as casual labourers and security guards. One of the key informants stated that poverty-related to the effects of climate variability has affected the Borana culture.He had this to say:

> *Climate variability has affected the Borana culture. Before it used to be a taboo to see Borana women being involved in prostitution, but of late there is an influx of young girls involving themselves in prostitution. If you walk in Isiolo town at night that is when you*

can understand what I am saying. They are usually found waiting for men customers near big hotels and lodgings. **(Key informant, Ministry of Water and Irrigation)**

Respondents revealed that severe droughts had brought about environmental changes, thusaffecting accessibility to basic necessities such as water, food and fuel which are the roles of women. This has impacted on gender-based roles, increasing the workload for women. Focus group discussants held similar views that women had many activities to attend to such as looking for family food and its preparation, searching for fuel, childcare and income-generating activities including small-scale farming and businesses. According to one focus group discussion:

One can simply tell from our appearance that is really suffering, struggles of life are written all over our bodies. We do a lot of work, looking for food, taking care of our children, travelling long distances to look for water and to search for fire wood. We work for many hours while our husbands just sit and eat miraa as they wait for us to prepare food for them. **(FGD, Kambi Mbule).**

Key informants stated that some women doubled their roles by working as house helps in Isiolo town during the day and attending to their families at night. In general women's workloads have increased due to a greater emphasis on non-livestock livelihood activities.This isconsistent with Nduma and Warui's (2001:105) work on diversity in income-generating activities for sedentarized pastoral women in northern Kenya which indicates that the Rendille women were engaged in many activities which include small-scale businesses, charcoal burning, and weaving in addition to their reproductive roles so as to survive. Babangura et al. (2010:44) made similar observations in South Africa that climate variability has increased the workload of women as

they are involved in food production, income-generating activities as well as caring for children and doing house chores. This extra workload for women makes them work for longer hours than men.

CHAPTER SIX

THE EFFECTS OF CLIMATE VARIABILITY ON THE COPING STRATEGIES OF THE BORANA

6.1 Introduction

This chapter presents the effects of climate variability on the coping strategies of the Borana. These strategies include livestock mobility, herd diversification, herd maximization, cut and curry, and eating wild fruits and vegetables.

6.2 Effects on management of livestock

6.2.1Livestock mobility

The findings of this study indicate that livestock mobility has been affected by climate variability in various ways. More than a third (36.6%) of the respondents said that droughts had caused water pans to dry up. Other respondents(23.5%) indicated that climate variability had contributed to livestock and human deaths, 18.8% stated that there was a shortage of pasture in areas which used to be referred to as fall back (*fora*) areas by pastoral communities, while 15.3% said that it had resulted in competition with other communities leading to conflicts.

This information was supported by focus group discussants and key informants who stated that droughts have become more severe and frequent than they used to be in the last 20 years. This has led to many pastoral communities migrating to similar regions in search of pastures resulting in conflicts**.** Lastly, 5.8% of the respondents indicated that some of the grazing lands have been converted into agricultural lands and settlements by the pastoral community. This was as a result of climate variability which has forced the communities to diversify their livelihoods.

Over the years, pastoralists have grazed their livestock along defined migratory paths. Focus group discussants and key informants indicated that livestock mobility has been used by pastoral communities since time immemorial. The major purpose of the mobility of the Borana community with their livestock was to save the lives of the livestock from deaths that could have occurred due to droughts as they were able to share resources with neighbouring communities. According to Oxfam GB (2010:16), traditionally pastoralists have practised different degrees of mobility to enable access toand utilisation of the heterogeneous landscape of the rangelands and to take advantage of the spatial and temporal differences due to the vagaries of the climate. However, the findings of this study indicate that frequent drought has contributed to forage and water shortages, thus, affecting the fall back areas and the migratory routes used by the Borana.

6.2.2 Distance travelled and destinations

The study findings indicate that climate variability has affected the distance travelled and destinations moved to by the Borana of Isiolo. In answering the question on whether the distance travelled had changed, almost all the respondents (99.7%) stated that it had and only 0.3% held a different opinion. According to the responses given, the longest distance travelled during the drought period was 550–600kilometres, while the shortest was between 50 and100kilometres. This information was also reflected in the key informant interviews and focus group discussions. This is what a key informant (a chief) had to say about the distance travelled:

> *When I was young, we used to find water without having to travel long distances as we do these days. Our domestic animals travel long distances to get water. I remember there were times when our livestock used to graze and browse for months near Isiolo town. Now that is a distant memory. The grazing lands no longer produce much due to droughts which have increased.* **(Key informant,Kambi Garba)**

This finding is in agreement with work conducted in the Great Horn of Africa by Ndikumana et al. (2000:76) which suggests that the distance moved was determined by the intensity of the drought, and the severer the drought the greater the movement. The study also revealed that climate variability had affected the migration destinations of the Borana. Focus group discussants and key informants supported this argument as they said that frequent droughts made the Borana pastoralists to move to areas where they never used to go in search of forage for their livestock. They added that before they used to take their livestock to graze and browse near Isiolo town, along the river valleys in Isiolo, Ewaso Nyiro and Kinna. However, with the intensification of climate variability they have changed their migration destinations to places such as Merti, Garbatulla, Sericho and Marsabit. They indicated that sometimes they moved with their livestock across the Kenya-Ethiopian border although this was not very common. At other times, they moved up to Meru and to Mt. Kenya forest in search of pastures for their livestock. In one focus group, members were in agreement that:*"During the 2005-2006 droughts we took our livestock to Mt Kenya forest. Most of our cattle died because of cold as they were not used to very cold weather. Most of them died of diseases related to cold weather; we came back with nothing."***(FGD Participants, Kambi Odha)**

6.2.3 Sharing of resources with other communities

It was important to know whether the Borana pastoral community shared resources with other communities on their migratory routes. Almost all the respondents (98.5%) said that they shared resources with the Turkana, Samburu, Somali, Gabra and Ameru communities, while 1.5% stated that they have never shared. The resources shared include pasture, water and salt. Pasture and water are shared during herd mobility throughout the year. However, according to 34% of the respondentssharing of resources has contributed to competition over similar resources and

thishas, in turn, led to conflicts between the pastoral communities. Focus group participants were in support of the information given by the respondents and this is what they had to say about resource conflict: *"We used to live peacefully with our neighbours, we used to take our livestock to graze in similar regions, but as the range resources dwindled due to droughts, competition over the existing resources has increased. This has led to resource conflicts between us and the Turkana and also with the Samburu."***(FGD, Kambe Mbule)**

About one-fifth (21.3%) of the respondents stated that sharing of resources has led to feed shortage, while 19% said that it had led to over-grazing culminating into desertification. Conversely, 11.8% of therespondents said that sharing of resources has caused over-population as many herders take livestock to areas with pasture,while 10.5% stated that it has led to the spread of diseases. Finally, 3.5% of the respondentssaid that it has contributed to livestock raiding.Figure 6.1 summarises these responses.

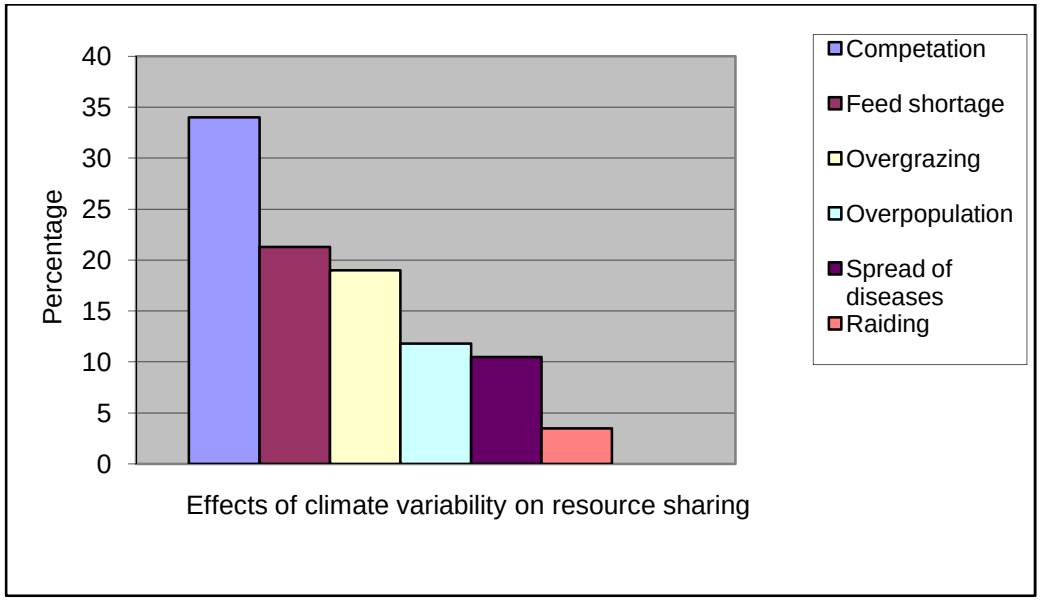

Figure 6.1: Effects of climate variability on resource sharing with neighbours

6.2.4 Past and present relationship between the Borana and their neighbours

The respondents indicated that 20 years ago they used to live harmoniously with their neighbours such as the Turkana, Somali, Samburu and the Ameru. However, in the recent past the Borana have been involved in conflicts with the Turkana and the Samburu communities. The respondents attributed this to climate variability which has led to the deaths of many livestock, thus, forcing the pastoral communities to embark on raiding one another. Cattle rustling used to be seen as a restocking strategy after a drought. However, the insecurity caused by raiding and the use of small arms has now made pastoralism a risky economic activity.

Focus group discussions revealed that in the olden days traditional norms and principles guided raiding activities, but the raiding has now evolved into a more complex activity. It has changed from being a quasi-cultural practice with an important element of livelihood enhancement into a more predatory activity that occurs on a large and violent scale. Drought periods also correlate positively with increased incidences of ethnic conflicts over stiff competition for water and pasture, which sometimes extends across borders. Pastoral insecurity determines grazing areas. When insecurity is high, livestock herds tend to concentrate in small secure grazing zones, while leaving large tracts of land unused in most parts of Isiolo County. Access to dry-period grazing areas is limited by the fact that cattle raids among neighbouring communities increase during droughts. Focus group discussants stated that some areas were considered to be no-go-zones or hot spots which included the mountains surrounding Isiolo, Sharp, Nyagachuru and Ewaso Ngiro valley.

According to focus group discussants and key informants herds were concentrated in small areas thought to be secure while leaving large tracts of land unused. A similar observation was made by Orindi et al. (2007:4) in some parts of eastern and north eastern Provinces of Kenya which were not used due to conflicts. Kagunyu et al. (2008:18) also made similar observations during their cross-border study among the Gabra of northern Kenya and the Borana of southern Ethiopia. Their findings indicatethat resource conflict between the two communities disrupted their migration patterns along and across the border. Violent conflicts rendered some regions as no-go zones or hot spots. Oxfam GB (2010:16) also indicates that rangeland resources have shrunk due to a number of reasons, including climate variability, alienation of pastoral land, conversion of wet-season pasture land to other uses, and conflict and insecurity pressures that have rendered some areas inaccessible.

According to the respondents, resource conflicts are particularly common during droughts when competition over grazing and water resources get stiff, sometimes involving cross-border fighting as in the case of the Turkana of north-western Kenya who have long running conflicts with neighbouring communities, some coming from southern Sudan and Ethiopia. The study findings clearly indicate that the Borana are not able to access some of their fall-back areas due to insecurity. The fact that these areas are not adequately policed encourages pastoral communities feeling insecure to arm themselves for self-protection, partly contributing to the proliferation of arms and sometimes creating a conducive environment for making quick money through raiding and selling of animals. The other factor which affects mobility is that long distance movements lead to heavy losses of livestock, while the existence of livestock diseases delays livestock movements to drought-refuge areas leading to heavy losses

6.3 Effects on herd diversification

6.3.1 Type of livestock species owned

This study wanted to find out whether the strategy of herd diversification was affected by climate variability. The first question was to know whether the respondents owned livestock and the types of livestock owned. The results indicate that more than a third (38%) of the respondents owned cattle, sheep, goats and camels, 28.8% reared cattle, sheep, goats and donkeys, 26% goats and sheep while 5.5% owned camels, sheep and goats. However, 1.8% said that they did not own any livestock because theirs had died as a result of recurrent droughts and those which survived the droughts were stolen by raiders. They were very miserable and just depended on help from well-wishers.

Focus group discussants revealed that the Barona's diversification of livestock herds had ecological and economic implications as different livestock species had different water and pasture requirements and reacted differently to droughts and diseases. According to them camels and goats are browsers, while cattle and sheep feed on grasses and low shrubs. Therefore, an area with a diversity of grasses and shrubs will best be used with a variety of livestock species, each employing different feeding habits. Lemma and Sugulle's (2011:12) study in Somaliland also indicates that in the past diversity of available forage used to allow the Somali community to raise different types of livestock in different combinations, that is, cattle, sheep, goats and camels. Due to their varied feeding habits.Their work indicates that cattle production dominated in agro-pastoral livestock production in Somalia. However, of late there is a shift from an old strategy that was centred on socio-cultural cattle pastoralism to a dependence on camel and small stock. The same case applies to the Borana community.

6.3.2 Effects on livestock keeping

On whether the households had stopped rearing some livestock due to climate variability, more than half (58.5%) of the respondents said no while 41.5% said yes. Thirty-four per cent of those who stated that they had stopped rearing some livestock added that they had stopped keeping cattle since these could not survive for many days without water.On the other hand, 5% of the respondents said that they had stopped rearing sheep because they could also not survive for many days without water. Finally, 2.5% said that they had stopped rearing chicken as they died in great numbers due to such diseases as Newcastle.

There was consensus among focus group discussants thatcattlerearinghas decreased among the Borana community of Isiolo. In their observation:

> *For a long time the Borana used to be known for having large herds of cattle. As pasture conditions deteriorated over the years and rivers dried due to recurrent droughts, cattle died in large numbers as they donot have the capacity to walk many kilometres without water and forage. These days things have changed. In some Borana households you will not find cattle, not even a single one. This was not the casefifty years ago.***(FGD, Kambi Odho)**

Key informants similarly indicated that cattle were heavy feeders and the people could not sustain them during drought periods. In addition, cattle got more stressed by high temperatures, subsequently dying in large numbers as compared to other livestock.

6.3.3 New livestock strategies of the Borana

This study had an assumption that the community had started rearing some livestock which were not being reared in the region as a resilient measure due to climate variability. A majority (71%) of therespondents said that they had not engaged in rearing any new livestock species apart from what they had before. Eleven per cent of the respondents said that they had started rearing camels because they were capable of surviving for many days without water in hot climatic conditions. This argument was supported by the focus group discussants and key informants who consented that camels were best suited for Isiolo County due to their ability to stay for many days without water. Ten per cent of the respondents said that they had started rearing chicken. The reasons for this are that chickens do not require much food as compared to other livestock species and that they are never stolen in raids. On the other hand, 2.5% of the respondentsstated that they had started keeping cross-breed cattle and goats because they produced more milk than the indigenous ones and one is also not required to have many of them, hence, they are easy to cater for. Finally, one person said that he had started rearing rabbits.

6.3.4 Most preferred livestock species

Respondents were asked about the most preferred livestock species in the region. A majority (71.5%) of them said that they preferred camels. The reason they gave for this was that camels are most suited for the region as they can stay for many days without water and food. This is in agreement with Field (2005:93) who states that camels are the best suited in the ASALs due to their biological and physiological adaptations, which help them to cope with the hot and arid environments. In addition, they have varied diets which include shrubs and their height allows them to browse tall trees.Focus group participants were in agreement that drought had affected

the range vegetation and this had impacted on the herd composition of the Borana. According to them:

> *In the last 50 years we used to have good grasslands and forages. This enabled us to have different livestock species. Today our range lands that were once covered with good grass-land have been replaced with unpalatable hardy and woody species. A change in vegetation composition from grass land to woody and unpalatable plant species, has forced pastoralists to alter their livestock composition from grazing to browsing species, that is, from cattle and sheep to goats and camels.***(FGD participants, Kambi Odho and Kambi Mbule)**

Field (2005:100) estimated that the volume of milk produced by camels is six times that produced by indigenous cattle found in the ASALs. In addition, the milk is believed to have medicinal value, helping in the management of high blood pressure and diabetes in human beings (Ngeiywa et al., 2012:20). Focus group discussants and key informants stated that camels have multiple purposes among the pastoral communities which include providing transport in the desert.In fact, many communities in the ASALs refer to them as "Lorries." They are also used for ecotourism and they fulfill many social, religious and economic functions. Focus groups discussants and key informants revealed that even the clans among the Borana, namely, *Karaiu Mbere* and *Aswa,* who used to consider camel rearing and utilizing camel products as a taboo have started rearing them and using camel products. A key informant who was in support of the shifting of the Borana community from cattle production to camel rearing had this to say:

> *The cattle owned by the Borana community die in large numbers whenever there are natural disasters such as droughts and El Niño rains. Their milk production is also very*

*low, producing two cups of milk daily. The community needs to be encouraged to keep camels as they produce more milk by far than what they get from cattle.***(Key informant,Ministry of Livestock).**

However, 22.3% of the respondents said that they would prefer goats and sheep because they give birth twice per year and sometimes give birth to twins. Focus group discussants indicated that small ruminants were easy and cheap to restock after a disaster. This argument concurs with that in Spore Magazine (2008:14)which states that livestock keepers have started rearing small ruminants as a mitigation measure against climate change. Those who were in favour of small ruminants indicated that they applied the zero-grazing system of production, whereby the owners were not required to go to insecure grazing areas. In addition, goats were considered to cause difficulty to livestock raiders as they disperse when approached.

On the other hand, 4.5% of the respondentssaid that they preferred rearing cattle and the reason they gave for this was that when they sell cattle they get higher incomes as compared to other livestock. In the past, the Borana community was attached to cattle; they used to claim that they are the "owners of cattle". Traditionally, any person in the Borana community who never owned cattle was considered to be very poor and such a person was loaned cows by relatives so as to build a herd. The research findings suggest that the trend has changed and even development agents like Arid Lands gave camels to pastoralists as a restocking strategy. Finally, 1.5% of therespondentsindicated that they had engaged in poultry production as these are never stolen by raiders. These results are presented in Figure 6.2.

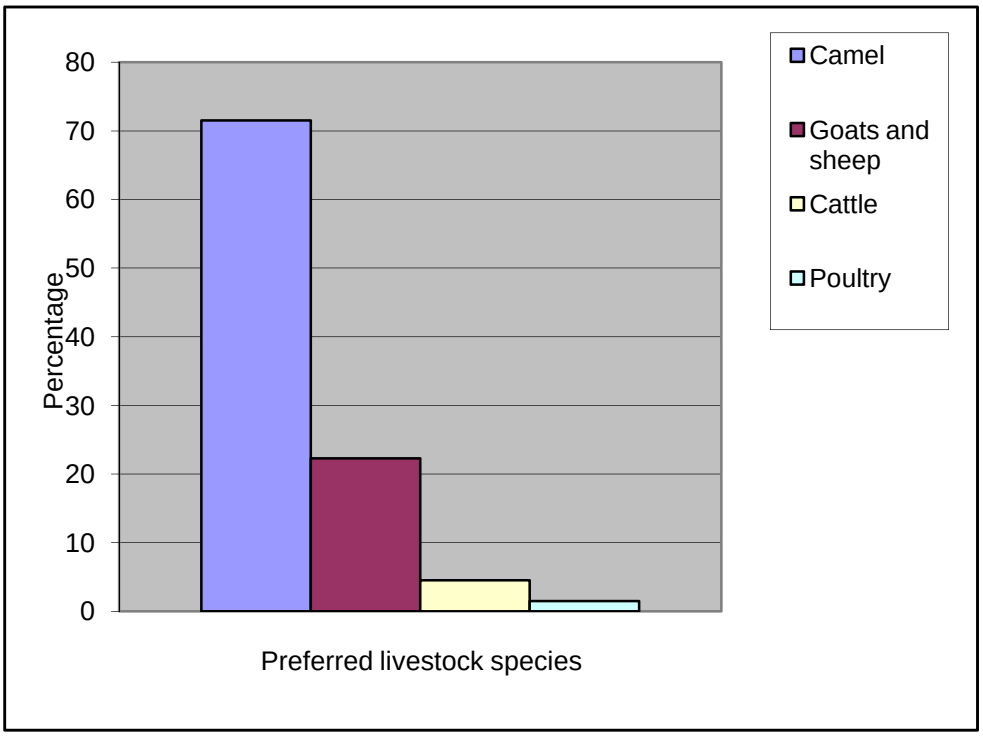

Figure 6. 2: Preferred livestock species

In conclusion, herd diversification as a coping strategy was affected by the deaths of some livestock such as cattle in great numbers. The other factor that has affected herd diversification are high prices of livestock after droughts. According to the focus group discussions, the prices of livestock are usually very low during the time of droughts. For example, a mature cow would fetch as little as KES 5000 while a mature goat would go for KES 500. However, the prices of livestock would shoot up making it impossible for most of the pastoralists to restock. The study findings also indicate that the foraging resources for the Borana production systems have been degraded and this has limited the potential for livestock diversity. The other factor which was said to have affected herd diversification is limited labour as the strategy used to be combined with herd splitting. This involved dividing livestock into small herds and grazing them separately. However, this has changed due to decreased labour force as children who used to

assist in herding go to school while young men have migrated to urban areas to look for alternative income-generating activities.

6.4 Effects on herd maximization

It is quite evident from the study findings that the herd maximization strategy has been affected by climate variability. This is because forty-three percent of the respondents said that frequent droughts had contributed to livestock deaths. On the other hand, 30% of the respondents indicated that a shortage of forage had affected herd maximization. This was supported by focus group discussants and key informants who stated that recurrent droughts led to range degradation as a result of which the area could not support large sizes of livestock. Furthermore, 20.3% of the respondents claimed that recurrent droughts have contributed to surface water scarcity because most parts of these water sources were fed by rainfall.

Key informants and focus group discussants stated that livestock diseases such as Rift Valley Fever, foot and mouth disease, and *Trypasonomiasis*, have led to livestock deaths, thus, affecting herd maximization as a coping strategy. They also attributed reduced herds of livestock in the Borana communityto livestock raiding which has been accelerated by the effects of climate variability. Focus group discussants pointed out that years back herd maximization as a coping strategy used to work well and it used to be combined with splitting herds. However, of late it does not work as drought has led to reduced vegetation in the rangelands. The study findings similarly indicate that the Borana used herd maximization as a coping strategy against natural calamities including droughts, floods and disease out-breaks. This was a practice whereby households kept large herds of different livestock species to maximize on the available grazing resources. According to Doti (2010:195), large herds increased the chances of livestock survival

during droughts and the outbreak of diseases. Big herds of livestock were traditionally used to feed large families as well as to build social alliances and future security through gifts to friends and clan members. The study findings reveal that this strategy has been affected by climate variability through many ways, including livestock deaths as a result of frequent droughts, shortages of forage and water which can no longer support large herds of livestock. Also, diseases related to climate variability such as Rift Valley Fever have led to livestock deaths. Another factor which has affect herd maximization is raiding which has become prevalent in the study area.

Key informants and focus group participants reported that the strategy used to work well in the past but of late it does not work as climate variability has led to reduced vegetation in the rangelands and as a result the Borana prefer to keep livestock which they can cater for. According to the information given by key informants, sometimes the Borana pastoralists are forced to buy livestock feeds but this is only possible in cases of a few animals. The respondents reported that climate variability has led to a change in the responsibility of herd management. Since young men have been forced to seek work elsewhere in order to diversify family incomes it is now older men, women and children who have to assume the responsibility of herd management. Because of lack of strong manpower for heavy tasks such as watering livestock or for scouting out areas before moving the herds, these new herd managers are more vulnerable to the effects of climate change than young men would be. Therefore, the community is no longer able to keep large herds.

6.5 Effects on cut–and-carry strategy

6.5.1 Types of feeds gathered for livestock

The study findings suggest that the Borana used to cut and collect leaves, plants and pods for their livestock. They used to do this for all livestock species and of all ages. Figure 6.3 shows that more than half (59%) of the respondents said that they collected grass and leaves from trees, while 23% stated that they gathered acacia pods, remains of fruits and vegetables. On the other hand, 10% of the respondents indicated that they gave crop residues to livestock. Thecrop residues included stalks of maize and beans from their small-scale farms. Another 6% said they gave hay and relief feeds to their livestock to sustain them during difficult times. Finally, 2% indicated that they fed their livestock on*Anno (Euphorbia trucalli)*.

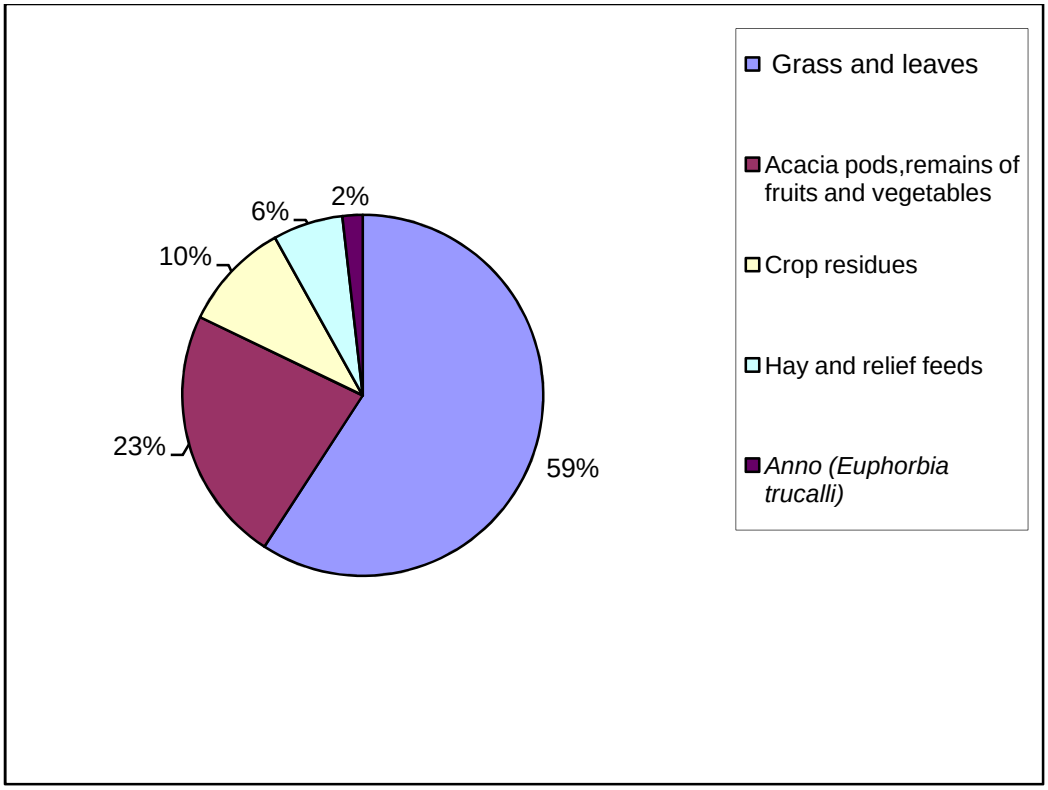

Figure 6.3: Feeds gathered during the drought period

6.5.2 Depleted forages

On whether drought has affected the availability of gathered forages, 88.3% of respondents affirmed to this while 11.8% said no. According to those in the affirmative, the rangelands used to contain quality forage and grass species that were used by all the different livestock species. They indicated that most of the forages were depleted due to overgrazing because of the fact that livestock tended to be concentrated in "safe" areas near settlements to reduce the chances of raiding. Consequently, this has led to the disappearance of valued perennial forages such as g*eddi (Echinochloa haploclada*), *kumude (Lannea alata),sigirso (Acacia reficiens),hido (Cynodon sp), a*nd *urbu (Acacia tortilis).Acacia pods* became fewer as trees were cut down and used for building and for fuel.The respondents also stated that due to drought sometimes the pastoralists were forced to buy hay to rescue their livestock but sometimes it was not available. However, if available, the prices are usually very high. Focus group discussants were in agreement that many of the plants have disappeared in Isiolo. According to those in one group:

> *In the past these areas were covered with grass and trees which we used to cut for our livestock especially during the dry season. Today to get grass for lactating animals we walk many kilometres. Most of the grasslands have been degraded due to overgrazing and also some of the areas have been converted for crop production. Fodder availability has decreased considerably in this area. (***FGD, Kambi Odha)**

These issues wereraised in the key informant interviews. This is what one key informanthad to say on the subject:

> *Floristic composition of the vegetation, which is an indicator of habitat quality, has highly decreased as large areas of forests, shrub and grasslands have been cleared for*

*bioenergy (charcoal and firewood), building and construction materials (timber, poles, thatch), crop cultivation and settlement, which have all occurred as a result of frequent droughts in the locality. (***Key informant, Kenya Forest Service)**

This is in support of Nduma and Warui's(2001:105) study among the Rendille which indicates that increased frequency of droughts has impacted negatively on the gathering of leaves, seeds, barks and tubers which used to supplement the family livestock based diet particularly during times of deprivations. Focus group discussants reported that over the years the availability and quality of pasture has deteriorated. According to them, the encroachment of unwanted plant species such as *Acacia drepanolobium and Prosopis juliflora* has resulted in a deterioration of the rangelands because besides reducing the size of the rangelands their pines are harmful to human beings and livestock.

6.5.3 Livestock forages which have emerged

On whether there were livestock forages which had emerged due to climate variability, a majority (63%) of the respondents stated that there were, while 37% said that there were none. Thosemajority stated that there were various plants and forage species which had emerged as a result of climate variability. The plants mentioned include Biscuit *Mjinga (Prosopisjuliflora),* commonly known as *Mathenge, gurbi (Acalypha sp),anno (Euphorbia trucalli), leuceana*(L*eucocephala*) and *caliandra (Calothyrsus*). Focus group discussants indicated that they had negative attitudes towards the utilization of *Prosopis juliflora* saying that they had heard that the plant was harmful to livestock and human beings. According to participants in one FGD:

This new plant is very dangerous. One of us was pierced by it and her wound took many months before she got well. Rumour has it that it destroys livestock teeth when they eat its leaves or theseeds and that its fluid can cause blindness when it comes into contact with the eyes of both human beings and of livestock. ***(*FGD, Kambi Mbule)**

On the other hand, focus group discussants stated that *anno (Euphorbia trucalli)* hadbecome very popular as food for camels, which never used to be the case before. They observed that the plant was plentiful in Isiolo and Meru Counties. Camel keepers have been sourcing for forage from neighbouring Meru County and this has promoted peri-urban camel rearing in Isiolo town. The general worry of the participants was whether the fluid substance found in the forage would be detrimental to the consumers of camel milk and meat. Other plants which were perceived as important by the focus group participants and key informants are*leuceana*and *caliandra.*These aremultipurpose plants used for fodder and fuel wood.According to the findings of this study these plants were introduced by the Ministry of Agriculture in an effort to promote agro-forestry practices in the region. Although there were fodder trees and shrubs which had emerged and others introduced as a result of climate variability, they were few and in small quantities. Thus, they could not be relied on to feed the livestock populations as severe and frequent droughts do not give them sufficient time to recover**.**

A key informant indicated that they were trying to promote agro-forestry in Isiolo County but their efforts were frustrated by frequent droughts and un-reliable rainfall. This is what she had to say about the intervention: *"I have been in Isiolo for three years and we have tried to promote tree planting in the County. This has not been successful due to a shortage of rainfall. The trees*

*have also been destroyed by livestock as they keep on eating them before they mature."***(Key informant, Ministry of Agriculture)**

6.6 Effects on traditional wild edible fruits, vegetables, roots and seeds

6.6.1 Types of edible fruits, vegetables and seeds

Wild edible plants refer to species that are neither cultivated nor domesticated but are available in their wild natural habitat. Wild fruits, vegetables and roots are occasionally used as food during drought, with some being available during droughts period while others are collected before the onset of a drought. During droughts and famines pastoralists collect wild foods such as roots, tubers, leaves and seeds on a regular basis. This work is done particularly by women and children. The products are relied on during times of crisis as a mitigation measure against food shortages. In answering a question on whether there were traditional fruits, vegetables and roots which used to be eaten by the Borana pastoral communities of Isiolo County, 85.8% of the respondentsindicated that there were while 14.3% said that there were none. The types of fruits given included*deka* (*Grewia tembensis), mader (Cordia gharat*),*qurqura* (*Zizyphus mauritiana), jaj jab (Berchemia*), o*gomdi (Grewia Villosa)*and *kumude(Lannea alata).* These plants produced fruits which were eaten by the Borana but mostly during periods of droughts and famines.

Others, such as*mader (Cordia gharat*) produced edible fruits and also their gums were chewed during drought periods. Conversely *urbu (Acacia tortilis)* pods were boiled and eaten during droughts. Some of the plants, such as *iddi hiddi* (*Solanumscabrum*) also produced vegetables and fruits eaten during droughts. Other wild vegetables eaten as revealed during focus group discussions include *sumalele (Mormodica trifoliolata)* which is boiled in water, and mixed with

salt to form porridge. The *ng'orondo (Cyphostemma nierrense)* plant also contributed to survival during drought. One of the elders made this statement, *"when herding, herders ate these plants and they got satisfied such that when they got home they did not eat anything more."* **(Elder, Kambi Odha, Isiolo).**

Eating wild edible plants was not only limited to the Borana of Isiolo since Musembi's (2010:2) work among the Akamba indicates that there are edible wild plants such as *Ficus sycamores.* Langill and Ndathi's (2001:69) work indicates that eating wild fruits, tubers and vegetables was of great importance in coping with droughts among the Rendille pastoralists of neighbouring Marsabit County, although their territory supports very few plant species. Lukekal et al. (2011: 81) also indicate that wild plants in Ethiopia are eaten as emergency, supplementary or seasonal food sources to avert food insecurity in households. For example, the invasive *Opuntia ficusindica* iswidely exploited for its fruits in many parts of northern Ethiopia, therebyplaying a significant role in food source diversification. The fruits of this plant are sold in many local markets in Ethiopia along with cultivated food sources (Lukekal et al., 2011:82). Serigne and Verchot (2006:8) notethat the gathering of forest products such as fruits, timber, medicine, firewood and honey for home consumption and for sale is becoming more important in East Africa.

6.6.2 Edible fruits, vegetables and seeds which have disappeared

On whether wild plants have disappeared, a majority (88.5%) of the respondents affirmed that many of the plants had disappeared while 11.5% were of the opinion that they had not disappeared. It also came out clearly from the study that the distance travelled while going to

collect wild fruits and vegetables had changed as a result of climate variability. For example a majority (81.3%) of the respondentssaid that the distance travelled is longer than it used to be, while 18.8% said that the distance had not changed**.** Focus group discussions revealed that the distance covered had increased and also they also indicated that some of the plant species had disappeared. A FGD at Kambi Mbule had this to say:

> *When we were growing up, wild fruits, seeds and vegetables were plenty. We used to get them near our houses. Today we walk very long distances to get some. There are some which are no longer available as they have been affected by the increasing droughts*.

This argument was supported by key informants. The reasons for the increase in the distance travelled and for the disappearance of some edible plants included alienation of land to give way for settlement and crop cultivation. There was an indication from focus group discussions and key informants that the Borana and other pastoral communities moved to Isiolo Central Division as a result of frequent droughts and famines leading to the deaths of livestock. Consequently, they settled in town where they could get relief food and health services from the government. Overgrazing is also associated with the disappearance of wild fruits, seeds and vegetables. The last reason is deforestation as people cut down trees for construction and for fuel wood.

CHAPTER SEVEN

EXTERNAL ADAPTIVE STRATEGIES

7.1 Introduction

This chapter gives details of the institutions which assist the Borana people whenever there are problems relating to climate variability. These include the organizations involved, the assistance given, respondents' attitudes to the assistance given and their suggestions for improvements.

7.2 Organizations that give assistance to the Borana pastoralists

The findings of this study indicate that 99.5% of the respondents stated that there were organizations that assisted the community during times of calamities. The institutions and organizations which were involved in assisting the community include government departments, NGOs and faith-based organisations. The organizations were ranked according to their level of involvement and contributions. A majority (70%) of therespondents said that government departments were highly involved in offering assistance to the respondents whenever they were faced with the negative effects of climate variability. They were followed by 25.8% who ranked NGOs as the second. These NGOs include the Kenya Red Cross, World Vision International, Food for the Hungry Kenya and Christian Children's Fund. Faith-based organizations had 3.3%, while 1% of therespondents said that there were no agents which assisted them. The faith-based organisations given by the respondents were the Muslim Council and Catholic Mission. Figure 7.1 gives the external agents which assist the respondents when faced with natural calamities**.**

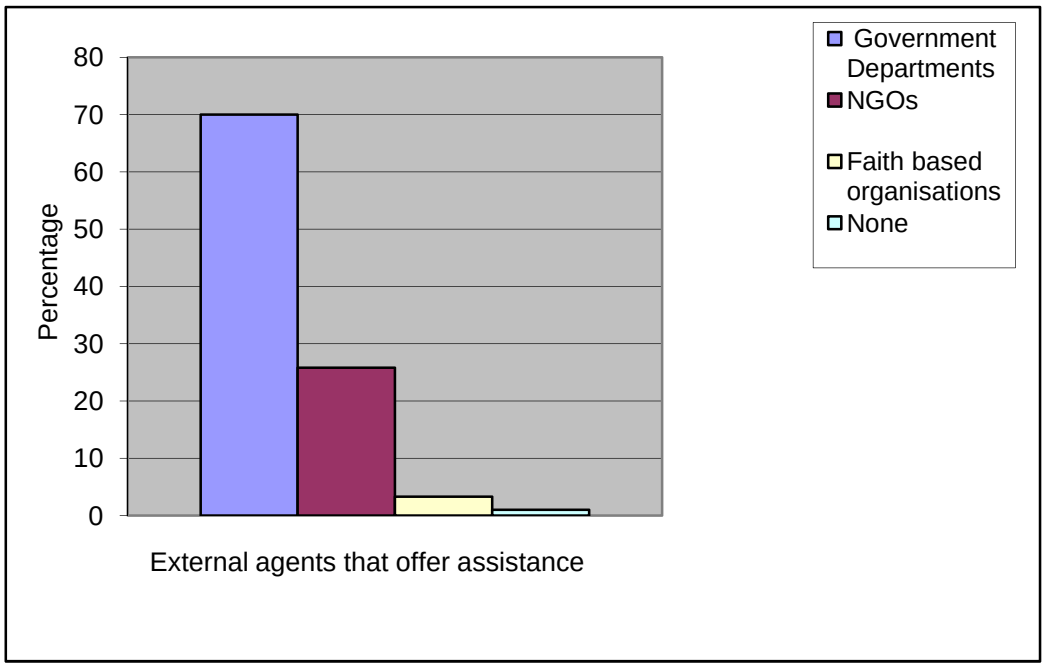

Figure 7.1: Institutions that offerassistanceduring calamities

7.3 Type of assistance given by government institutions and other organizations

Figure 7.2 shows the type of assistance respondents got from the external agents. Half (50%) of therespondents suggested that they were given relief food and feeds for livestock. This was mainly done by the government whenever there were droughts and floods. On the other hand, 22% indicated that they were given medicine while 17% were resettled whenever there were floods and ethnic conflicts. Other (7.5%) respondents said that destocking and restocking where other forms of assistance given.Destocking programmes were initiated by the government during times of droughts to avoid massive losses of livestock. Key informants reported that after severe droughts pastoralists were given a few livestock to build a herd. Government departments including Arid-lands and Ewaso Nyiro Development Authority (EDA) and NGOs were reported as being involved in restocking initiatives. Another 2.5% of the respondents stated that subsistence funds are given to the elderly, while 1% indicated that no assistance was given.

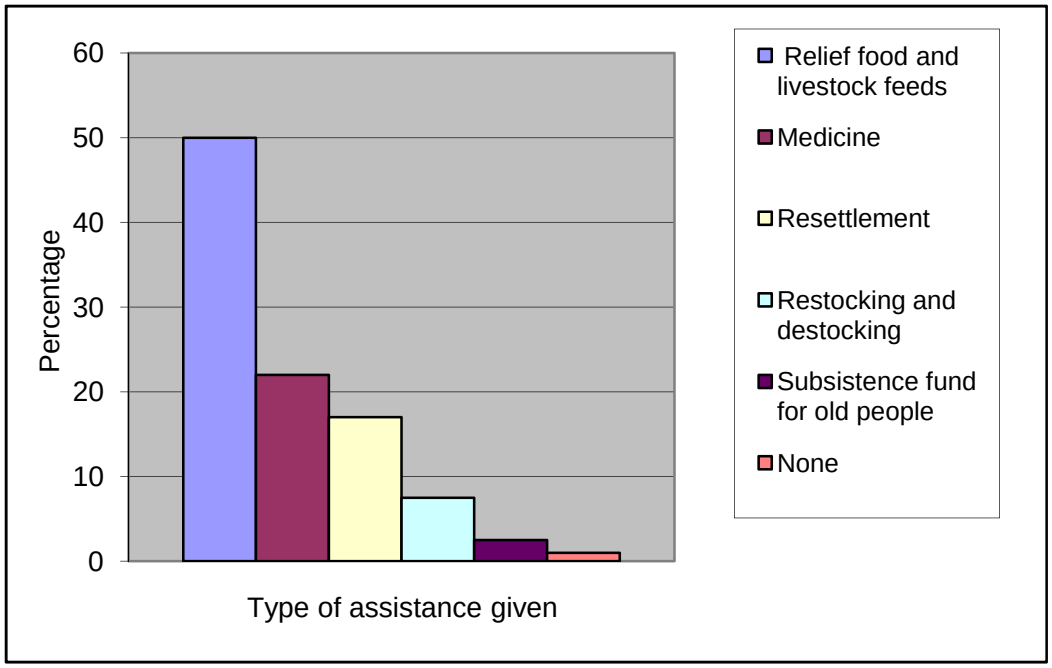

Figure 7.2: Type of assistance given by the Government and other organizations

7.4Attitudeof respondentstowards assistance given

The study findings suggest that the government, NGOs and faith-based organisations had made efforts to assist the Borana pastoralists whenever they were faced with the negative effects of climate variability. Figure 7.3 shows that a majority (61%) of the respondents stated that the type of assistance they got was not enough. However, the food given was very little, it was never available on time and sometimes it was given after three months. The other problem was that the assistance given sometimes never reached the intended beneficiaries. Relief food was usually intended for the very poor but in many cases the largest share ended up in the hands of the rich. Those respondents who said that the type of assistance given was not enough added that they needed a more and equitable distribution of the relief food.

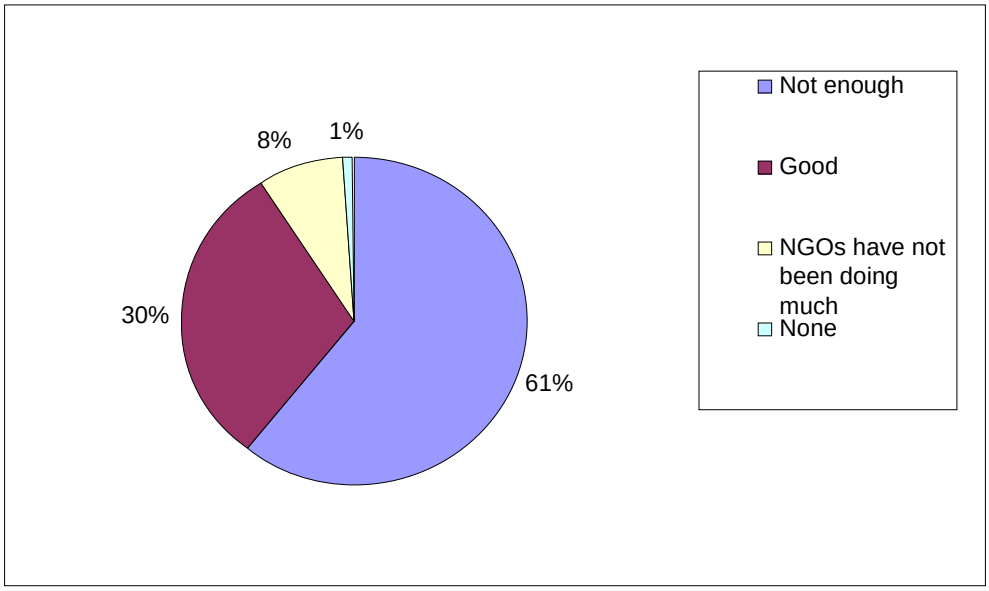

Figure 7.3: Attitude of respondents towards assistance given

The assistance given includes relief food, livestock feeds, medicine, resettlement, restocking and destocking, subsistence allowance to elderly people, promotion of peace, and provision of seedlings. However, most people felt that they were not getting enough of this assistance. Serigne and Verchot (2006:12) made a similar observation that despite the fact that development agents in Africa have made efforts to bail out pastoralists from the problems created by climate variability, there has been an inherent problem in the way climate variability is being tackled in the region.Instead of promoting long-term structural development that would reduce the vulnerability of the local communities, African governments, together with their development partners, tend to provide relief after disasters have struck (Serigne and Verchot 2006:12). This approach has two major shortcomings: (1) relief only offers short-term solutions to crises and (2) it keeps the local community in a chronic state of dependency. Obviously, this is an ineffective and costly way of addressing climate-related disasters. Focus group discussants indicated that even the relief foodmeant forthe poor ended up in the hands of the rich.

Thirty per cent of the respondentssaid that the type of assistance given was good, 8% indicated that the NGOs were not doing much while 1 % said that no assistance was ever given.This information was supported by focus group discussants, who indicated that development agents were not doing enough to bail out the community from the problems they were facing as a result of climate change.According to one group:

> *Most of the organisations working in Isiolo County were established to assist us but instead they benefit those people who work with them. Their happiness is when we are in problems so that they can continue working in this County. They are here to serve their own interests but not of the local community. We have approached many of them with a proposal from community-based organizations for support but have ended up getting negative responses.* **(FGD, KambiOdha)**

This was also confirmed by a key informant who had this to say:

> *The relief food meant for the poor especially those who have lost their livestock do not reach the intended recipients. The food is usually sold by the government officers and heads of the NGOs, what comes to the individual homes is very little, sometimes a family of seven individuals gets4kilograms of maize, 1kilogram of beans, a quarter of cooking fat and onekilogram of sugar. The food is not reliable, furthermore it comes after three months when people have really suffered and to make matters worse when it comes not everybody gets it.***(Key informant, Kambi Garba)**

7.5 Adaptive strategies not implemented on a large scale

Study findings indicate that the Borana use other adaptive strategies but which are not implemented on a large scale. For instance, Figure 7.4 shows that 38.5% of the

respondentssaidwater harvesting technologies, 35.5% talked of restocking programmes and 17% listed irrigation and agricultural inputs. On the other hand, 5.8% of the respondentstalked oftree planting.Lastly, 3.2% of the respondentstalked of un-employment. One of the key informants suggested that if a slaughter house was constructed in Isiolo County, it would savelivestock losses which have been encountered by pastoral communities while waiting for the Kenya Meat Commission (KMC) to buy their livestock when they are on the verge of death.

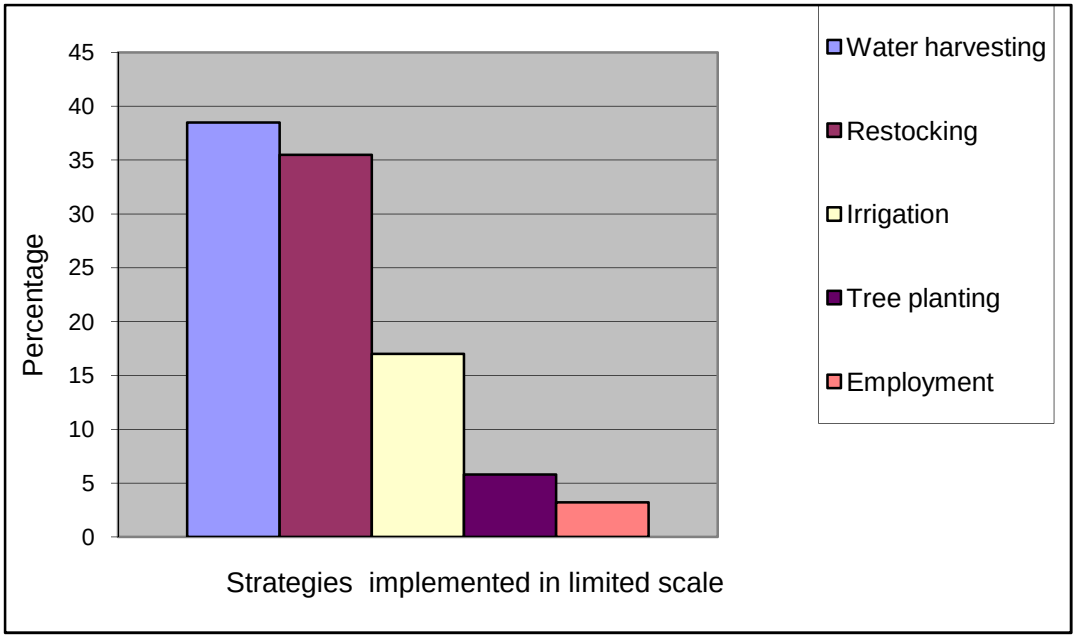

Figure 7.4 Adaptive strategies not implemented on a large scale

On the mostsuitable developmentorganization to initiate adaptive strategies against the negative effects of climate variability in the study area, a majority (75%) of the respondentssaid that the government was the most suitable. Twentyper cent of therespondents indicated that NGOs were the best suited, while 5% said that the community was the best suited.

7.6 Respondents' perceptions of why some adaptive strategies were implemented on a limited scale

Various reasons were given by respondentsregarding why some suitable adaptive strategies were not implemented on a large scale (Figure 7.5). Forty per cent of them stated that they had no people to represent them. They said that most of the people who were selected as leaders were selfish and did not mind about the problems of the community. On the other hand, 22.3% of the respondents said that this was due to poor leadership and management of government institutions and organizations. They also stated that most of the development agents were corrupt and concentrated on buying vehicles and initiating projects which were not beneficial to the local communities. Focus group participants were also in agreement with this information as shown in the following:

> *We see government officers moving with big cars and not helping us. Some government departments such as EDA spend a lot of money buying cars even for their messenger and secretaries. We get very concerned as the locals of this place since that money spent on buying cars is supposed to support development projects in this county. Managers and coordinators of these organizations are concerned about their welfare alone.***(FGD, Kambi Mbule)**

Another 17.8% of therespondentsstated that they were not consulted when development agents were initiating projects. This means development agents used the top-bottom approach when

trying to solve climate variability-related problems which is a wrong approach in project implementation.One of the key informants was in support of this and had this to say about it:

> *There are so many development agents in Isiolo County but they do very little. They donot seem to be assisting much. The type of assistance they give is very little. They put up very expensive water structures without consulting experts and the local communities and they end up failing. This is wastage of resources which are meant to help the local communities.***(Key informant, Ministry of Water and Irrigation, Isiolo County*)***

Twelve per cent of the respondents stated that pastoralists were marginalized and that their views were not taken into consideration. Focus group discussants supported this argument as they stated that pastoralists havealways been marginalized by both the colonial and post-colonial governments. According to the two groups:

> *The colonial government had a negative attitude towards pastoralism. Pastoral livelihood wasn't valued and was regarded as not useful to the colonial enterprise. To the colonial government it was perceived as wasteful and disturbing. The independent governments were also not in favour of pastoralism as an enterprise. Pastoralists were marginalised and pastoralism has been looked at with skepticism and development partners have been struggling to look for exist strategies.* **(FGD Kambi Odha and Kambi Mbule).**

This information is in agreement with a report by Oxfam GB (2008:14) which indicates that pastoral communities are marginalized on the basis of their geographical remoteness, their ethnicity, and their livelihood, which is still seen by many governments across the region as an outdated way of life that needs replacing with 'modern' livelihood systems. Another 6.8% of the respondentsstated that departmental heads were not from Isiolo County, and so they were not well versed with the priorities of the local communities. Finally, 1.3% of therespondents said that

people were not united,and so were not in a position to voice their grievances with one voice. These results are presented in Figure 7.5.

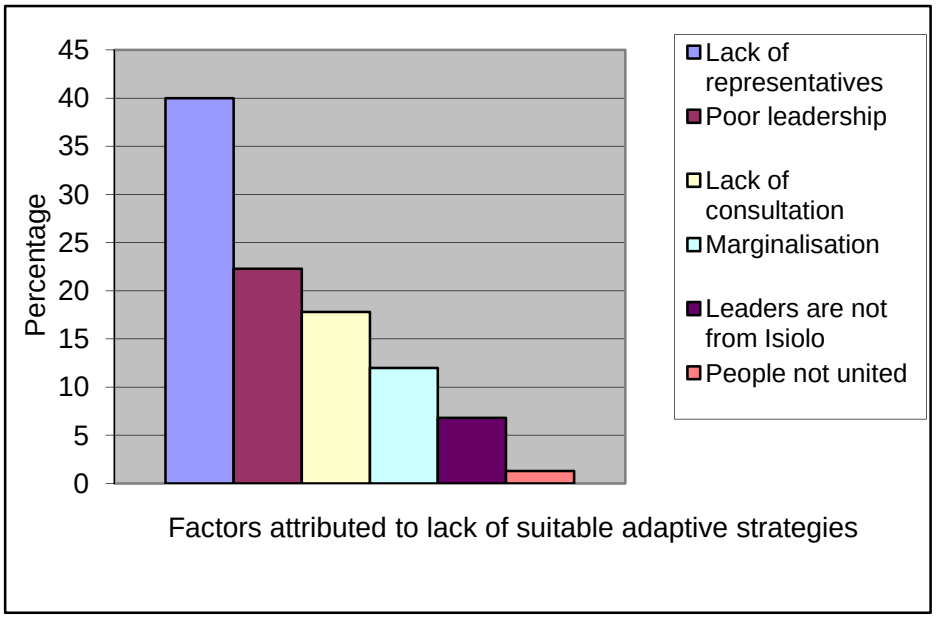

Figure 7.5: Why suitable adaptive initiatives are not initiated in the study site

7.7 Suggestions on suitable adaptive strategies against negative effects of climate variability

Respondents came up with suggestions which could help in reducing the negative effects of climate variability. Twenty-one per cent of therespondents suggested that the construction of dams and boreholes would be a good initiative which could assist people and their livestock.According to them, some areas such as Sharp had good forage for livestock butthere was no water. They said that if water was provided it would minimize competition over natural resources and stop inter-ethnic conflicts. This was followed by 18.5% of the respondents who said that there was a need for the Borana to be trained in appropriate farming skills since they had started engaging in small-scale farming activities.Seventeen per cent of the respondents

suggested restocking and government offering good livestock markets, 13% the provision of feeds and livestock drugs throughout the year, while 12% suggested maintenance of peace and harmony amongst the warring communities of Isiolo County. Another 6.3% of the respondents stated that pastoralists need to be trained in hay bulking and storage, 3.5% suggested tree planting, 3.5% said pastoralists need to be prepared in advance before any disaster strikes, 3.2% suggested the need to provide pastoral communities with jobs, 2%the need to assist the pastoralists with funds to start businesses, while 1% indicated that there was need for the government to set aside ranches as fall-back areas for pastoral communities which could be used during times of droughts and other natural calamities.Figure 7.6summarises these responses.

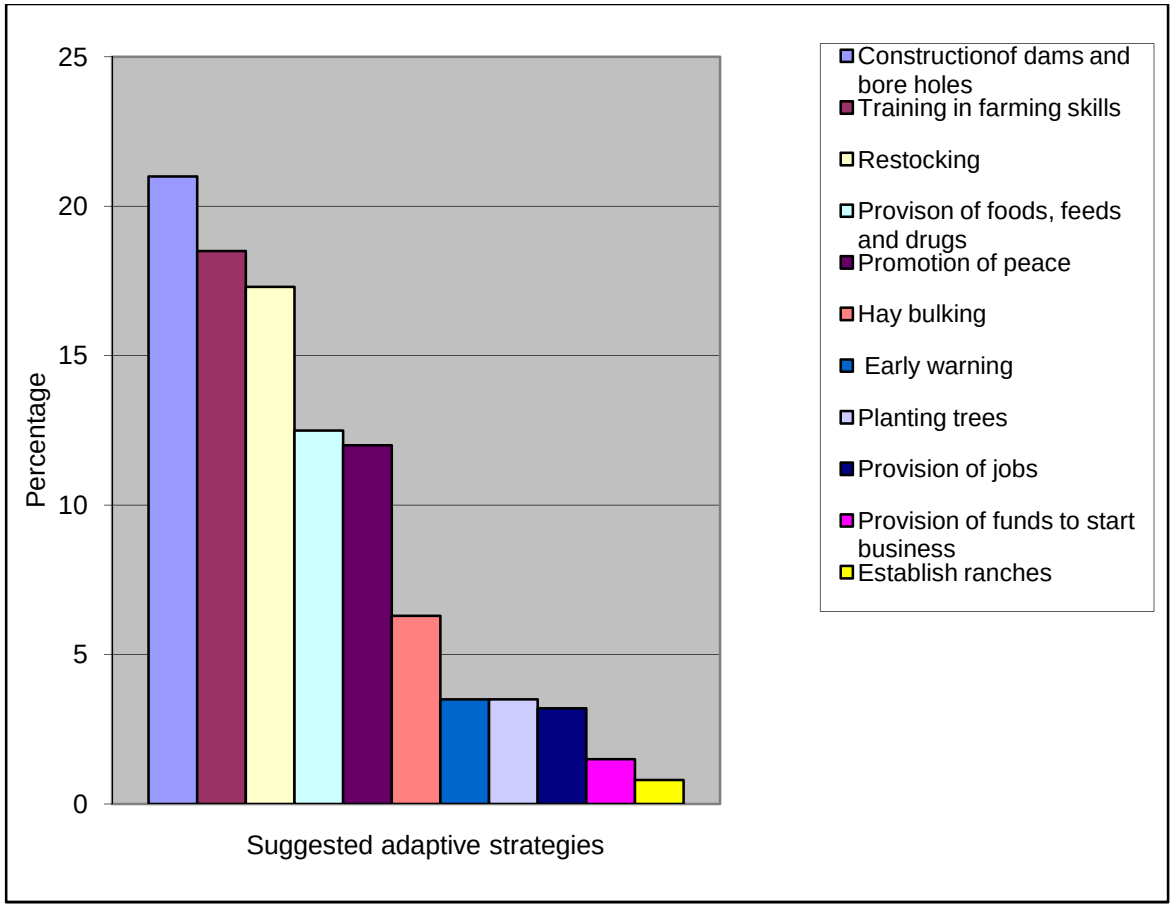

Figure 7.6: Suggestionsby respondentsto reduce negative effects of climate variability

Field observations revealed that many households had kitchen gardens in their compounds. Information gathered from focus group discussions also revealed that the community had embraced crop production which was traditionally viewed as a taboo and a poor man's way of earning income. They concurred that the Borana community used to have a negative attitude towards crop production and the practice used to be perceived as a curse to their livestock. This is because the Borana traditionally believed that if people engaged in crop production, their cattle would die. However, the effect of climate variability has forced the community to change its negative attitudes towards crop production.

Key informants were in agreement that climate variability had made the Borana to be dependent ondevelopment agents throughout the year and this problem would only be solved by introducing long term adaptive strategies. One of them had this to say:

> *Pastoral communities wait for relief thoroughout the year. Even when there is no drought they expect to get relief food. This has created a dependency syndrome and laziness. It is high time these communities are encouraged to be self-reliant. Relief food should be decreased and instead they be sensitized on appropriate activities which are sustainable. There is a popular saying which states that instead of giving a person a fish show him how to fish.***(Key informant, NALEP)**

CHAPTER EIGHT

SUMMARY, CONCLUSION AND RECOMMENDATIONS

8.1 Introduction

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

8.2 Summary

8.2.1 Cultural ecology

An ecological approachto the study of pastoralismviews itas a mode of production and way of life adapted to harsh conditions of the arid environment (Awoundo-Odegi 1987:16). It is a land use system which puts into profitable use scanty and sparsely distributed resources of marginal areas without doing damage to the ecology. The fragility of the ecology, scantiness of the land resources and their scarcity due to low and erratic rainfall made it imperative for the pastoralists to develop well balanced resource utilization regimes. They developed herd management practices which included livestock mobility, herd diversification, herd maximization, supplementary feeding (cut-and-carry) and reliance on wild food plants. This study indicates that climate variability has led to adjustment mechanisms in the Borana community. As an adjustment mechanism non–pastoral pursuits have become very common among the Borana.The pursuits include out-migration with livestock in search of pasture and water. There has been an influx of young men and women from rural to urban areas in search of jobs. Other non-pastoral activities consist of petty trade, small-scale farming, casual labour and formal employment. The

action taken by human beings when they are hard hit by disaster depends on how hard hit they are and the options available for them.

8.2.2 Resilience theory

Galaz (2005:9) views resilience as the capacity of an ecosystem to tolerate disturbance without collapsing into a qualitatively different state that is controlled by a different set of processes. A resilient ecosystem can withstand shocks and rebuild itself when necessary. Advocates of resilience theory emphasize on four aspects that is, adaptation, adjustment, transformation and reorganization. The Borana community has been able to adapt to the harsh climate in Isiolo using indigenous coping strategies. But after realizing that their coping strategies are being affected by droughts they have adjusted by engaging in some non -pastoral activities. The community has undergone transformation by migrating to towns to look for jobs and also settling in town and relief camps where they can get relief food and medicine. Resiliencetheorists encourage reorganization when the situation deteriorates. This has happened to the Borana of Isiolo County. They have come up with new systems of survival by settling in urban centres, shifting from their attachment to cattle to camel keeping and changing their eating habits. Figure 8.1 summarizes the findings of this study.

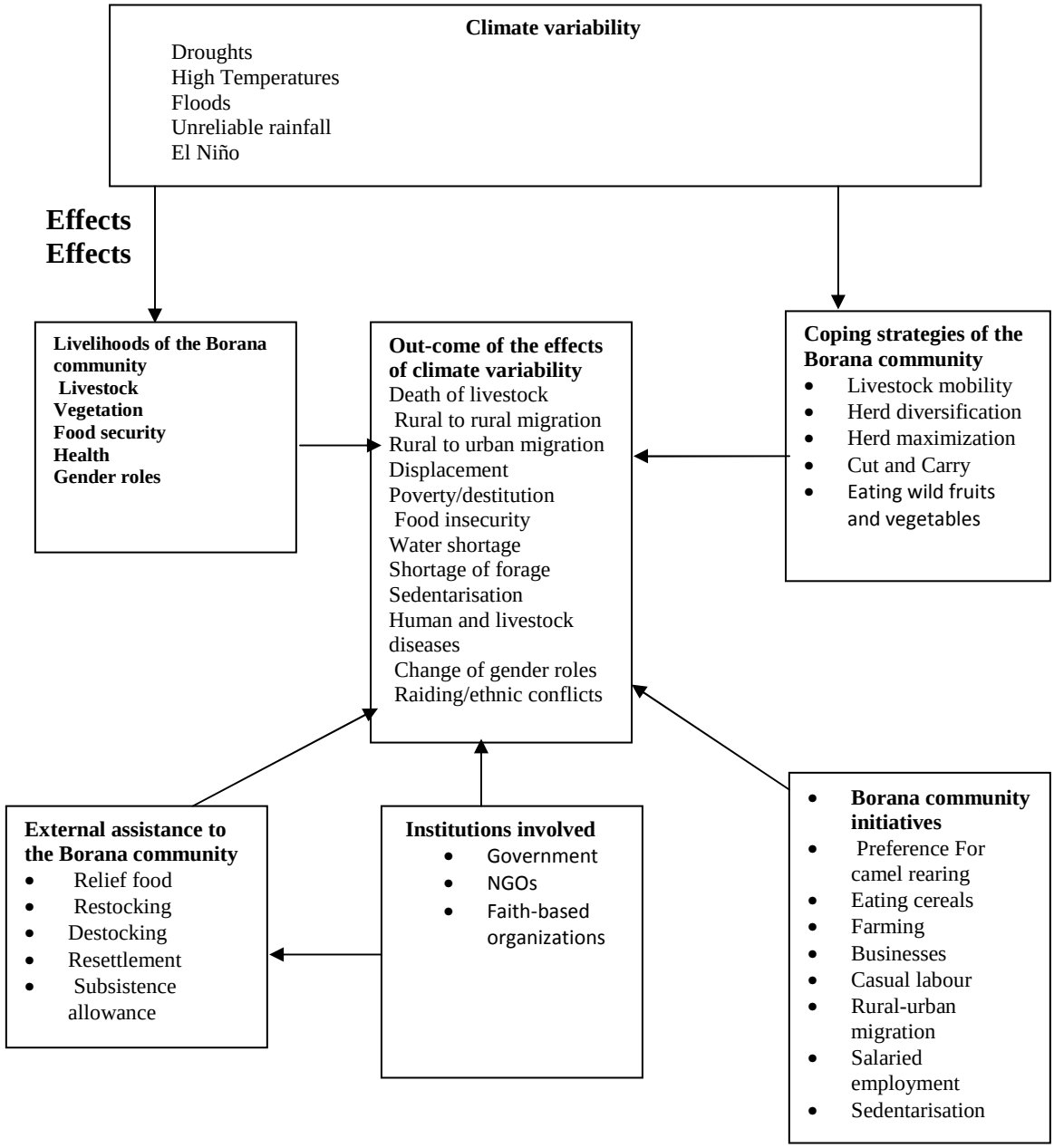

Fig 8.1: Summary of the study findings

8.2.3Borana community's knowledge on climate variability

The research findings reveal that the Borana areaware of climate variability and even have a local name for the weather variations, that is, *jijirama qilesa* which means "change of climate". Climate variability was perceived and expressed in theform of prolonged droughts, shortages of rainfall, *El Niño* floods, violent storms and seasonal changes. There was a general consensus

among the respondents, focus group discussants and key informants that climate variability was real and that drought occurrence has become more frequent than it used to be before since in the past it used to occur after 10 years but these days it occurs after 3 years or sometimes yearly. This study also revealed that rainfall has decreased and is more un-reliable than it used to be in the past twenty years. Also, the dry season was becoming longer while the rains failed more often.

Climate variability was attributed to three factors, namely,human-made activities, God's doing and natural calamities. Human-made factors were ranked highly as having contributed to climate variability.These include the cutting down of trees, industrialization, over-population and over-grazing. The study also indicates that climate variability is seen as a result of God's doing. This is because God wanted to show his power as the creator of everything that exists. It is God's punishment for people's wrong-doing and, lastly, it isGod's test to his people.There is danger when people associate climate variability with God because instead of looking for strategies to address the problem they pray over the issue.

The study also shows that the local people are well versed with their ecosystem and the changes that aretaking place. They have various indigenous weather forecasts, for droughts, rainfall and floods. They do this by observing the behaviours of some animals, birds, insects, stars and plants. A growing understanding of the Borana local environment is based on their cultural and ecological contextsand is passed down from one generation to another through socialization. This indigenous knowledge has enabled the Borana pastoral community to develop indigenous coping strategies which have assisted them to cope with natural disasters in the past.

8.2.4 Effects of climate variability on Borana livelihoods

The study has shown that climate variability has significantly affected the livelihoods of the Borana community. This is because an increased frequency of drought events and increased fluctuations in rainfall in the region has placed a great stress onthe livestock and local livelihoods.

The study findings suggest that the economic status of the community has been affected as climate variability has led to the deaths of livestock which is the major economic activity of the community. Droughts have caused fluctuations in livestock population through increased mortality and reduced birth rates due to decreased forage and water availability. Similarlymassive losses of livestock due to climate-related factors such as droughts and floods have pushed offlarge numbers of Borana pastoralists from pastoralism and they have become destitutes relying on relief food and begging. Climate variability is also associated with displacement as some members of the community, especially men, move with their livestock for many months in search of forage and water, while other men move to urban areas in search of employment. In some cases these migrations lead to family break-downs as women, the elderly and children are left behind. As a result of thissome women engage in immorality, while some men establish other families in the urban areas. Migration of the surviving livestock in search of pasture and water also leads to food shortages and this has led the Borana community to shift from eating livestock products to cereals. It was also reported that climate-related livestock and human diseases have become prevalent. The emergence of new livestock diseases and the spread of the old ones affect the pastoral communities greatly as it leads to livestock deaths, closureof livestock trade and the use of a lot of funds to purchase drugs. The prevalence of human diseases

affects the livelihoods of the Borana pastoral communitysince many hours which would have been used in constructive work are spent on taking the sick tohospital andalso buying drugs.

Great livestock losses have pushed the Borana below subsistence level, and forced the community tosettlenear towns and watering points where they can easily access relief services such as food and medicine. However, in most cases it is only women, children and the elderly who have settled while most men remain mobile and herd the remaining livestock. While sedentarisation in most cases ispushed by droughts, it has equally elicited a change in lifestyle. This is because a settled pastoralist now engages in non-pastoral activities such as small-scale farming, petty trade, casual labour and salaried employment.

8.2. 5 Effect of climatevariability on coping strategies

This study's results reveal that the Borana community has developed different types of coping strategies which they use whenever there are droughts and floods. These strategies include mobility between wet and dry season grazing areas or rotational grazing, herd diversification, herd maximization, feeding livestock using the cut-and-carry method and eating wild foods. However, the findingsalso show that the Borana coping strategies are highly affected by climate variability. For instance, a coping strategy such as livestock mobility has been curtailed by a combination of factors such as the drying up of water points and shortages of pastures forcing the Borana community to move very long distances in search of water and forage for their livestock. Climate variability has also led ethnic conflicts between the Borana and the neigbouring communities due to competition over scarce resources. These conflicts have confined the Borana pastoralistsin safe areas and this has led to overgrazing.

Furthermore, the study findings indicate that the herd diversification coping strategy has been weakened because it has led to the deaths of some livestock species such as cattle and sheep. Specifically cattle get more stressed by high temperatures, subsequently dying in large numbers as compared to other livestock species such as camels. This gives a good explanation as to why the Borana community has started camel rearing even by those who used to consider engaging in camel rearing and eating its product as a taboo. In fact, to cope with current climatic conditions the Borana have had to focus on browsing livestock such as camels and goats. The following local saying: *Jiddu lafa qabadhuu (If you fall down hold the ground)*justifies why the Borana should focus on camels and goats.The herd diversification strategy has further been weakened by the rural–urban migration as able-bodied men move to towns leaving old men who, on the other hand, are not able to cater for all the livestock. Lastly, high prices of livestock after droughts make it impossible for the Borana to restock. The prices of livestock are usually very low during times of drought, but afterwards the prices become too high for the poor pastoralists to afford.

The other coping strategy which was reported to have been affected by climate variability is herd maximization. This strategy used to work well in the past 20 years but of late it does not as climate variability has contributed to a reduction in vegetation in the rangelands. The implication of this is that the available vegetation is not enough to support large herds of livestock. Consequently, the Borana now prefer to keep the number of livestock which they are able to cater for.

The Boranaused to have livestock supplementary feeds for their livestock during times of crisis. The feeds included shrubs, plant leaves, crop residues, hay, forage and food by-products. The

feeds were collected for all livestock especially during times of drought. However, most of these forages are no longer available due to climate variability.Moreover, acombination of repeated drought, failed rainy seasons, and the disappearance of palatable pasture species has reduced the availability of forage, leading to issues of over-grazing, and furthering the vulnerability of pastoralist production. Consequently, this has led to the disappearance of valued perennial forages and land degradation. The recurrent droughts have affected the availability of wild edible plants the Borana community used to rely on. The distance they travel to look for such products has increased while other wild edible plants have disappeared.

8.2.6 Role of External Organizations and Institutions

The findings of this study indicate that the government, NGOs and faith-based organizations have been trying to reduce the vulnerability of the Borana pastoralists from the effects of climate variability. Government departments were ranked highly in offering assistance to the Borana as compared to other development actors. However, most of theinterventions offered tended to be short-term in nature showing a limited understanding and lack of appreciation for pastoral livelihoods. The respondentsacknowledged that they received relief food from the government and other organizations which they, however, considered to be very little and is not reliable since it is supposed to come on a weekly basis but sometimes comes after three months. The government and other development organizations have been conducting destocking programmes whenever there is drought but this assistance comes very late. This delay leads to great losses to the livestock keepers. For example, the Kenya Meat Commission (KMC) comes to buylivestock when they are totally emaciated and about to die, thus paying very little for them.

It also came out clearly that the development actors are not keen on addressing climate-related problems affecting the Borana community. This is because instead of concentrating on long-term projects they tend to focus on relief food which is a short-term project. This is an indication that the interventions by the government and other actors have fallen short of producing the desired results. The needs of the pastoralist have not been recognized and they are invariably marginalized by the government and development partners. As a result of this the study subjects stated that the development actors need to focus on long-term projects such as the digging of dams, irrigation as well as advising the community to rear livestock species which are suitable to the environment.

8.3 Conclusion

This study sought to establish the effects of climate variability on the coping strategies of the Borana community of Isiolo County. On the basis of the above discussion, the following conclusions can be drawn.

First, a majority of community members were knowledgeable about climate variability. However, the population as a whole had three explanations for the causes of climate variability: human activities, nature and God. Those who linked climate variability to human activities and nature would be in a position to look for mitigation measures, while those who associated it with God might just wait for God to have His way. However, despite their knowledge on climate variability and the causes attributed to it and the early warning signs the community continues experiencing its effects since they have no alternative means of survival.This is because the people lack resources to tackle the effects of climate variability as long-term adaptation strategies require a lot of capital and labour.

Second, climate variability has negatively affected the livelihoods of the community in a great way. Recurrent droughts and floods have led to the deaths of livestock resulting inpoverty and displacement. As a result of this some Borana pastoralists have been pushed out of pastoralist activities since they have lost all their livestock. Severe droughts have led to a shortage of livestock forage and water leading to low milk production and the deaths of livestock. This has in turn contributed to food insecurity in the community as reflected in its reliance on relief food.

Third, the results of this study suggest that climate variability has weakened the coping capacity of the Borana community. This is because the search for water, for both human and livestock consumption, and forage has triggered mobility and migration in the community. This coping strategy has been affected in various ways, for example, through competition with other pastoral communities leading to resource conflicts. Conflicts make it impossible for the pastoralists to have access to some areas and they are forced to graze their livestock in areas which are perceived to be safe causing over-grazing and degradation. The herd diversification coping strategy has also been affected negatively by climate variability as frequent droughts have led to shortages of forage causing deaths of many livestock and in particular cattle. Livestock raiding by other livestock keepers and limited labour as a result of the most able-bodied members of the community migrating to urban areas in search of jobs has similarly contributed to the weakening of herd diversification.Even herd maximization which involved having large herds has been affected by climate variability. Conversely, a shortage of feeds makes it hard for the local people to sustain large sizes of livestock. The emergence of new livestock diseases and the spread of old ones have affected herd maximization. Cut-and-carry as a coping strategy hasalso been affected

by over-grazing, while some wild edible plants which used to be eaten by the Borana community have disappeared as a result of climate variability.

Finally, the development agents working in the study site are not assisting the community effectively. This is because they apply a top-bottom approach without involving the community in decision-making.In most cases inappropriate interventions are put in place such as providing maize to the community when what they really need is livestock for restocking.

8.4Recommendations

1. This study recommends a combination of the existing indigenous early warning indicators with modern forecasting methods to make them more appropriate.

2.The government and other actors should assist the community with new mode of coping strategies.

3. There is a need for government departments, NGOs and faith-based organizations to ensure full and effective participation of thecommunity in the conception, design and implementation of sustainable solutions to reverse the effects of climate variability.

8.5 Further research

1. The study recommends a study to document the number of Borana ex-pastoralists due to climate variability, the type of activities they engage in and the constraints they face in implementing their activities.

2. The study also recommends that more research needs to be done concerning wild edible plants, their nutritional status and their mode of propagation.

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APPENDICES

Appendix 1: Household Questionnaire

Hallo

Good day to you. My name is Anastasia Kagunyu and I am a student from the University of Nairobi. I am carrying out a study on climate variability in this area. The findings of this study will be used to write a PhD thesis in Anthropology. I hope you will spare some time to answer my questions. All the information collected will be treated as confidential.

Part 1

1:1 Socio-demographic characteristicsof respondents

Date of interview----------

Code of respondent ----------

1. Location ---------- Sub –Location ----------Village ----------
2. Sex ---- ----------

1. Male---------- 2. Female----------

3. Age

(1) 20 - 30 (2) 31 - 40 (2) 41- 50 (3) 51 – 60 (4) 61 and above

4. Marital status

1. Married 2. Single 3. Widowed 4. Separated 5. Divorced

5. Educational level----------

1. None 2. Primary 3. Secondary 4. College

6. Occupation----------

7. Number of children Boys ---------- Girls ----------

1.2: Perception of climate variability, indicators and trend

8. Have you experienced any climate variation in this region for the last 20 years? ----------

---

9. Give reasons for the answer you have given above. ----------

---

10. According to you, what could have caused climate variability?

---

11. Give reasons for your answer ----------

---

12. What are the indicators of climate variation in this region? Rank them in order of severity----

---

13. Please indicate after how long the indicators you have mentioned occur in the locality---------

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14. Give the community's perceived signs of each indicator----------

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15. In your opinion, how reliable are these signs? ----------

---

16. Has there been any variation in temperatures for the last 20 years?

1. Yes 2. No

17. If yes, explain the change choosing between the two multiple choice questions.

They have become hotter than they used to be.

18. How do you get information on climate variability? ----------

---

19. Which is the best way of passing information on climate variability in this region?----------

---

Part 2: Effects of climate variability on livelihoods of the Borana community

1.In your opinion, has climate variability affected the social life of pastoral communities?

1. Yes 2. No

2. Give reasons for the answer you have given above.----------

3. Please indicate whether there have been any of the following changes as a result of climate variability.

Perceived change	**Tick what is appropriate**	**Give details of your answer**
Change of environment		
Change of eating habits		
Building styles		
Occupation		
Food security		
Livestock diseases		
Human diseases		
Gender-based roles		

Other (indicate)		

Part 3: Effects of climate variability on pastoralist copping strategies

3.1: Effects of climate variability on pastoralist's migration pattern

1 Is migration one of the coping strategies against climate variation in this region?

1. Yes 2. No

1. How has climate variability affected migration as a copping strategy? Explain ----------

---

2. Has climate variation affected the distance moved?

    1. Yes 2. No

3. Give reasons for the answer you have given above ----------

---

4. Has climate variability affected migratory destinations? 1. Yes 2. No

5. Explain the answer you have given above - ----------

---

6. If affected, explain how they have been affected. ----------

---

7. Have you been sharing resources with other communities? 1. Yes 2. No

8. Give details of the answer you have given above.----------

---

9. Has the sharing of resources been affected by climate variability? 1 Yes 2. No

10. If yes, explain how this has been affected.----------

---

11. Please describe the type of relationship existing between your community and the neighbouring communities. ----------

---

12. Please indicate how your relationship has been with your neighbouring communities in the last 20 years. ----------

3.2: Effects of climate variability on herd diversification

1. What type of livestock do you have? ----------

---

2. Have you stopped rearing some livestock in this region due to climate variability? 1. Yes 2. No
3. Give details of the answer you have given above ----------

---

4. Have you started rearing some livestock species that you never used to rear before? Yes 2. No
5. Give details of the answer you have given above. ----------

---

6. What are the most preferred livestock species in this locality and give reasons why they are preferred?----------

---

3.3: Effects of climate variability on herd maximization

1. Has climate variability affected your herd maximization as a coping strategy?

1. Yes 2. No

2. Give details of the answer you have given above ----------

---

3.4: Effect of climate variability on cut and carry of livestock feeds

1. What are the supplementary feeds for livestock in this locality? List them. ----------

---

---

2. Please indicate if climate variability has caused any effect on them, e.g , their availability.----------

---

3. Are there some livestock feeds which are no longer available in this region?

1 Yes 2. No

4. If Yes, name them ----------

---

5. Are there some new species of feed which have emerged as a result of climate variability? 1. Yes 2. No

6. If Yes, name them ----------

3.4. Effects of climate variability on wild fruits and vegetables

1. Are there traditional fruits/vegetables existing naturally in the rangelands?

1. Yes 2. No

2. If No what could be some of the possible causes of their disappearance? Explain ---------

---

3. If your answer to question 2 is yes, are they still being used by your community today?

   1. Yes 2. No

4. Is there any change between the distance you cover when going to get them today and the one that used to be there before? 1. Yes 2. No

5. If Yes, give details ----------

Part 4: Existing external institutions/organizations assisting the Borana community in the study area.

1. Are there some institutions involved in assisting your community with adaptive strategies to mitigate the negative effects of climate variability? 1. Yes 2. No 2. If yes, rank them according to their importance to the community in the table below and the type of assistance they give.

Organization/Institution	**Type of assistance**

3. What is your attitude to this assistance? ----------

---

4. List some adaptive strategies which you think have not been tried in this locality but which could be helpful. ----------

---

5. If there are some adaptive strategies which have not been implemented in the region, what do you think could have been the reason/reasons for them not being tried?----------

---

6. Which is the most suitable organization to come with climate variability adaptive strategies?
    a. Community
    b. GoK
    c. NGOs
7. In your opinion what measures can be put in place to reduce the negative effects of climate variability in future? ----------
    ----

Appendix 2: Key informant interview guide

1. Which department/organization do you work for? ----------

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2. For how long have you been in Isiolo County? ----------

---

3. Depending on the duration the respondent has been at Isiolo. Whether he or she has witnessed any climate variation and make comments of what has been witnessed----------

---

4. What are the community's early warning signs for drought, floods and normal rains? ----------

---

4. What are the indicators of the variation? How climate variability has has affected their coping strategies?

---

5. How has climate variability affected their livelihoods? How has it affected their socialwellbeing?

---

6. Are there external agencies that have been assisting the pastoralists whenever there has been a disaster?----------

---

7. What type of assistance have they been getting? ----------

8. Are there adaptive strategies which would be more suitable for the area? Name them

---

Appendix 3: Focus group discussions guide

1. What is your understanding of climate variability in this locality?
2. What is the local name for climate variability?
3. What is the meaning of that name?
4. What are the indicators of climate variability in the region?
5. What is the historical trend of climate variability?
6. What are the community's early warning for normal rain, floods and drought if they have?
7. Is there any difference between the droughts experienced in the past decades and the ones occurring in this decade?
8. What coping strategies did you use in the past and how effective were they?
9. How have the vegetation, land forms and livelihoods been affected by climate variability?
10. Is there any change in the type of livestock species reared in the past 20 years and what is being reared today? So, why is the case?
11. Have there been any changes in gender-based roles in the last 20years? If so, why the changes?
12. What options do the pastoral communities have to reduce future negative effect of climate variability?

Appendix 4: Observation checklist

1. The surroundings of the Borana community.
2. Type of vegetation in the area.
3. Type of water bodies existing in the region and their condition.
4. Type of house lived in.
5. Type of food eaten.
6. Types of activities conducted in the region.
7. The type of forage available and also wild fruits and roots.
8. Migratory routes.