

**ADAPTATIONS AND COPING STRATEGIES TO DROUGHT AMONG
PASTORALIST COMMUNITIES IN *SHEBELLEY* DISTRICT, SOMALI REGIONAL
STATE, ETHIOPIA**

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**Adaptations and Coping Strategies to Drought among pastoralist
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Science in Environmental Science and Management*

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DEDICATION

I dedicate this thesis manuscript to my father **Husein Abdilahi Sigad** and my mother **Sado Ismail Zed**, for nursing me with affection and love and for their dedicated partnership in the success of my life.

STATEMENT OF THE AUTHOR

I hereby declare that this thesis is my real work and that all sources of materials used for this thesis have been properly acknowledged. This thesis has been submitted in partial fulfillment of the requirements for an advanced M.Sc. degree at Haramaya University and is reserved at the University Library to be made available to borrowers under the rules of the library. I seriously declare that this thesis is not submitted to any other institution anywhere for the award of any academic degree, diploma, or certificate.

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BIOGRAPHICAL SKETCH

The author was born in February of 1989 in Tog-wuchale city consul of Fafan (*Jigjiga*) zone of Somali Regional State of Ethiopia. He attended his primary and junior school at Inna Aabo Primary and Secondary School at Tog-wuchale city. He then attended his preparatory school at Jigjiga Senior Secondary School. Upon his successful completion of his high school education, he joined Haramaya University in October 2013 with B.Sc. Degree in *Natural Resources Management* and graduated in July 2016. Soon after his graduation, he decided to pursue his education and he joined the School of Graduate Studies (SGS) of Haramaya University for his M.Sc. study in *Environmental Science and management* (ESM) in 2017/2018 academic years.

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LIST OF ACRONOMY

ASALs	Arid and Semi-Arid Lands
CSA	Central Statistics Authority
FGDs	Focus Group Discussions
SDPPB	Somali Disaster Prevention and Preparedness Bureau
GHA	Greater Horn of Africa
ILRI	International Livestock Research Institute
HHs	Households
IPCC	Inter-Governmental Panel on Climate Change
NGO	Non-Governmental Organization
NMA	National Meteorological Agency
UN-OCHA	United nations Office for Coordinating Humanitarian
SDPPB	Disaster Prevention and Preparedness Bureau
FAO	Food and Agriculture Organization
PFE	Pastoralist Forum Ethiopia
SC-UK	Save the Children United Kingdom
SDPPB	Somali Disaster Prevention and Preparedness Bureau
SLCRDB	Somali Livestock, Crop and Rural Development Bureau
SPI	Standardized Precipitation Index
UNCCD	United Nations Convention to Combat Desertification
UNDP	United Nations Development Program
WMO	World Meteorological Organization

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Abstract

This study highlights drought characteristics and the long-term and short-term responses to drought stresses employed by Shebelley pastoralists of Fafan zone, Somali region. To achieve the objectives of this study, cross-sectional study design has been conducted. Both qualitative and quantitative data were combined to identify drought coping and adaptations strategies of Shebelley pastoralist with 120 households' interviews, focus group discussions and key informant interviews were conducted to capture various aspects of drought and drought adaptation and coping practices. Standardized precipitation index (SPI) derived from long-term rainfall data obtained from the National Meteorological Agency was used to identify drought frequency and severity from 1980 to 2015. SPI revealed that frequency and severity of drought events were increasingly for the last 36 years in Shebelley district. In the study area, 21 droughts out of the 36 years of analysed rainfall has been identified ranging from mild to moderate droughts. The study has also identified that drought severity has increased in Shebelley area for the last three decades. These recurrent droughts have negatively impacted on pastoral livelihoods. In order to adapt to or cope with frequently occurring droughts, Shebelley pastoralists are using a variety indigenous short-term and long-term strategies. Long-term adaptation they use includes mobility to track forage and water sources, herd diversification, regular selling of livestock, tackling of livestock diseases by using traditional methods, diversification of livelihood sources and shifting to agro-pastoralism (sedentarisation). In addition to this, proactive and reactive short-term coping strategies is used. Proactive were including; buying and storing food grains and making a ghee for dry seasons while reactive copings were including the slaughtering of weak animals during drought periods, livestock selling, consumption of wild fruits, re-stocking, social supporting systems, herd and family splitting, charcoal and firewood selling and changing breeding time of their livestock in line with their indigenous climate prediction called Xidigis and dependence on food aids from the government and NGOs.

Key words: Adaptation, Climate variability, Coping strategies, Drought, Pastoralism, Shebelley.

1. NTRODUCTION

1.1 Background

Drought forms a period of months or years that rainfall gets less than the annual average and it results in a severe scarcity of water (Angassa and Oba., 2007). Drought according to UN-OCHA (2011) has remained one of the major disasters that contribute to a higher vulnerability among the mobile pastoral communities who are the endemic population to drought effects, because of slow drought onset and accumulative impact over a period to their livelihoods. Therefore, it has caused severe economic, social and environmental losses in both pastoralist and agro-pastoralist (Ruijs *et al.*, 2011).

In East Africa and by extension, the Greater Horn of Africa (GHA), pastoralism is one of the most important economic activities from which millions of people derive their livelihoods. Pastoralists in this region keep a significant part of their wealth in form of livestock. For example, out of the total population, pastoral and agro-pastoral population are about 60% in Somalia; 33% in Eritrea; 25% in Djibouti; 20% in Sudan and 12% in Ethiopia. Pastoral areas in Ethiopia are located in the North-Eastern, Eastern, Southern-Eastern, and Southern, and South western part of the country (PFE, 2012).

Livestock in the pastoral areas are the major source of food (milk and meat) and income, as well as a source of employment. They also serve similar purposes and functions for people living in urban and rural towns adjacent to the pastoral areas. Livestock contribute a significant amount to the national economy. In terms of gross national product, the contribution of livestock to the agriculture sector and the national economy is 40% and more than 20%, respectively (Kidane., 2014.).

Over thousands of years, pastoralists have managed their resources and livelihoods in the face of environmental challenges and difficult socioeconomic conditions (Mortimore, 2010). They to large extent developed their own long term livelihood strategies and coping mechanisms in harmony with their environment. Recent decades show that pastoralists are challenged in maintaining these livelihoods and coping mechanisms due to a range of ecological, demographic, economic, social, political and climatic causes. Consequently, they become impoverished, marginalized, vulnerable, and increasingly face both chronic and acute crisis (FAO, 2011).

The Ethiopian Somali region is one of the regions with large number of pastoral and agro-pastoral community. The region in general and *Fafan Zone* in particular have seriously suffered from recurrent droughts. Added to the harsh environment, the *Fafan* pastoralists have been the front line victims of recurrent droughts. The severe impact of the drought in the year 2011 as not completely healed, when it was again heated in 2015/16. *Shebelley* district was one of the most seriously affected areas in the region in 2010/11 droughts (SDPPB, 2012).

Recurrent droughts, among other anthropogenic factors, have deteriorated the ecosystem, eroded livelihood assets of pastoralists and thereby jeopardized livelihoods of the pastoralists. Nevertheless, the pastoralists have never been passive victims of drought. This is because it presents a more logical adaptation route than other livelihood activities and land uses which do not have the advantage of mobility (Anderson *et al.*, 2009). Pastoralists therefore employ various coping and adaptation strategies to deal with climatic shocks like droughts.

Up to date, government drought emergency programs are limited to provisioning of relief food, resettlement of destitute pastoralists and sometimes, a livestock salvage exercise. These programs are often planned on an *ad hoc* basis and thus lack a long-term outlook. Current policies have one thing in common: they assume that destitute nomads have no chance of resuming nomadism in the light of environmental deterioration and the apparent threat from continued drought conditions. Therefore, 'new ways of adaptations must be found for the pastoralists (UNDP, 2012).

Instead of declaring pastoral livelihoods unviable and implicitly endorsing policies that undermine pastoralism and turn doubtful assertions in to inevitable facts, observers and policy makers need to recognize the responses that pastoralists are themselves coping and adapting to the stresses and shocks that their livelihoods system has always faced. Therefore, development interventions in the pastoral areas need to be based on the knowledge of the area, the people and the indigenous strategies used to adapt to the changing situation (Hadush., 2014). In this regard little has been done in the Somali region in general to understand the dynamics of the pastoral system particularly in the *Shebelley* district pastoralist.

The recent study made by Deveruex (2010) is one encouraging work conducted in the region on vulnerability of livelihood in the region that helps to guide policy makers and development practitioners. The current research represents an endeavour that is also geared towards the same direction, i.e., contribution to the understanding of the frequency and severity of drought as well as the local adaptive strategies of pastoralism in the *Shebelley* district of *Fafan* zone.

1.2. Statement of the Problem

About 75% percent of Ethiopia's landmass is categorized as dryland, experiencing moisture stress during most days of the year, and having only 45-120 days of growing season per year (Kidane., 2014). These areas are home to about one-third of the country's population, as well as to a comparable proportion of livestock. The most widespread livelihood in the drylands is pastoralism, which relies on a diversity of grass and shrubs as key productive inputs. The total pastoral area in Ethiopia is estimated at about 625,000 km², which is 57 percent of the country's total area, of which the Somali National Regional State comprise 37 percent (UNDP, 2012).

Pastoralists have traditionally made optimum use of the fragile natural resource base of rangelands by practicing a mobile and extensive livestock-keeping system (Mortimore., 2010). However, in recent years a number of complex concerns have emerged that render effective livestock production more difficult and burdensome for the pastoral nomads in arid and semi-arid lowlands. These includes diminishing rangeland resources, rapid increase of human population, environmental degradation and policies that are not supportive to pastoral production system. Beside the socio-economic and bio-physical challenges mentioned above, climate change is increasingly becoming a burden, affecting the livelihood pattern and strategies of the poor, and triggering food, feed, water and social insecurity, particularly through increased droughts (UNDP, 2012). Drought has been a feature of the *Somali* region pastoralist since immemorial time and was seen as recurring within intervals of an average of 10 years. However, over the past decades, drought seems to occur more frequently, in some areas almost every year, leading to severe land degradation and losses of livelihoods.

To address these problems, numerous sectoral projects, interventions and policies were initiated and implemented for the decades. However, most of them have failed to reach expected outcomes of transforming pastoral communities into more resilient community to climate extremes i.e. drought. This is due to the existence of differentiated interests and strategies within the pastoral communities, between population groups and between pastoralists and the government (Hadush., 2014). For instance, government policies aimed to transform pastoralist into more sedentary agro-pastoral community whereas majority of local pastoral household's aspirations is to restock and sustain pastoralist livelihoods mode. At the same time, the enclosure of land by influential individuals is also causing tension with pastoralists who lose access to key resources needed to survive droughts.

Current domination of some interests and groups over others in power relations, policies and decision-making processes can lead to increased vulnerability of pastoralist to recurrent drought let alone to creating more resilient communities. Local indigenous knowledge adaptations and copings have been critical in managing environmental variability such as droughts over a long period in many pastoral communities in Ethiopia. Therefore, studying pastoralism dynamics and understanding local indigenous drought response strategies with formal research would contribute the development of effective policies in the future (SC-UK, 2010).

Pastoral studies in general at Regional level and *Shebelley* district in particular are scarce. Regardless of the relative proportion of the population size, many of the few studies on Somali region pastoralists seem to focus more on the *Shinile* pastoralists due to a decades of political instability in most parts of the region. This implies that there is a need for studies that focus on understanding how *Fafan* zone pastoralists, particularly *Shebelley* district pastoralist's coping and adoptions with these frequently occurring droughts.

Therefore, this study sets out to examine drought characteristics, frequency and severity, identify adaptation processes more broadly as long-term mitigation measures and assess temporary coping responses to drought among pastoralist in *Shebelley* district. Knowledge about pastoralists' adaptation and coping responses to drought stresses can guide possible intervention measures, as well as better inform policy planned to reverse the decline in pastoral production systems, and hence ensure continued sustainability of rural livelihoods in arid and semi-arid environments.

1.3. Research Questions

In order to address the stated problems, a set of research questions were formulated to guide the research process. The main research questions were:

The research addresses the following specific research questions:

- *What is the frequency and severity drought in Shebelley for the last decades?*
- *What are the pastoralist household's perception toward causes and frequency of drought in Shebelley district?*
- *What are the short-term coping response to drought used by the pastoral community in Shebelley district?*

- *What type of long-term drought adaptation strategies used by the pastoralist in the Shebelley area?*

1.4. Objectives of the Study

1.4.1. General Objective

The general objective of this research was to study adaptations and coping strategies to drought practiced by the pastoral communities in *Shebelley* district of Fafan zone.

1.4.2. Specific Objectives

The specific objectives of this study were:

- ✓ *To examine drought frequency and severity for the last three decades in Shebelley district.*
- ✓ *To identify long-term drought adaptation measures used by Shebelley pastoralists.*
- ✓ *To assess temporary coping responses to drought used by the Shebelley district pastoralists.*

1.5 Significance of the Study

Understanding the indigenous coping and adaptations drought response strategies practiced by the pastoral communities would significantly assist policy makers in designing programs and formulation of policies, scheming appropriate strategies and practical steps based on their indigenous droughts response to reduce recurrent drought impacts and promote sustainable development in pastoral communities. The developmental practitioners like NGOs and researchers working on drought related aspects; can use it, as a benchmark or supplementary information for pastoral development and livelihood intervention.

1.6. Scope and Limitations of the Study

The study has been conducted to identify drought frequency and severity and to assess the community's short-term coping practices as well as their long-term adaptation response. This study covers only one of the pastoral Kebeles in *Shebelley* district of *Fafan* zone. This study mainly focused on the specific nature and socio-economic set up of the *Somali* pastoralists in *Shebelley* district of the *Fafan* zone; hence, the results and findings were the livelihood reflections of the study area community. The study was limited by the time, budget and other resource constraints. Even if the study was restricted in terms of its coverage, its findings can be used as a catalyst for more detailed and area specific studies.

2. LITERATURE REVIEW

2.1. Pastoralism in the African Context

Dryland regions occupy forty-one percent (41%) of the earth's surface. They occur on every continent, are occupied by over two billion people, and often experience a crisis (Birch and Grahn., 2007). The combination of inherently fragile ecosystems and human population pressure can result in some environmental changes, such as soil erosion leading to rangeland and agricultural degradation that are often easy to detect and measure. One of the most important issues in dealing with these changes and responses is to arrive at possible solutions that can result in ameliorative changes before the crises become irreversible. The addition of climate change exacerbates the situation for dryland landscapes, with predicted measures to hydrological regimes and vegetation composition and cover that would have serious implications for human populations (Anderson *et al.*, 2009).

Arid and semi-arid lands (ASALs) occupy 70% of East Africa – ranging from 95% in Somalia, more than 80% in Kenya, 60% of Uganda and approximately half of Tanzania and around 75% of Ethiopian land mass (Birch and Grahn., 2007). These drylands are productive and contribute to national economies and to the society at large. They support agriculture, livestock rearing, tourism and wild resource harvesting, and play a critical role in ensuring national food sufficiency (UNDP, 2012).

Pastoralism has developed autonomously across the world's drylands from some 7,000 years ago (Nessef., 2009). In Africa It has evolved over a long period of time as a rational response to the fragile ecosystem and is still widely practiced today and remains a dominant feature in dry areas of rural parts of the continent. It was a successful subsistence strategy and formed a livestock economy, serving distant markets upon which many non-pastoral people relied conditions (Anderson *et al.*, 2009). This is no longer the case today as climate variability and change in the region is taking its toll on the pastoral economies.

Arid and semi-arid lands exhibit ecological constraints, which set limits to pastoralism and agro-pastoralism. As suggested by Swift (2002), the major constraints include the inherently erratic nature of rainfall, a high rate of evapotranspiration, and low organic levels. Incidences of droughts are increasing, leaving the pastoral systems at the brink of collapse.

The people are impoverished and forced to seek out a living on a diminishing resource base, and they are at a risk of being dislocated altogether from their lands (SC-UK, 2010). Lack of rural income and competition with large commercial producers such as commercial ranchers are challenging the pastoral system and are increasing the hardships among the African herders. “*The Tragedy of the Commons*”, a famous piece of work by Hardin in the 1960s showed that it is in the interest of the herder to increase his herd size since he will gain all the benefits of having a larger herd while sharing any misfortune with the others. Similarly, Beyene and Korf (2008) considered both communal grazing and heavy stocking rates as prime factors for the deteriorating conditions of rangelands and for the subsequent failure of pastoral economies. In other words, it is to the advantage of each individual herder to increase their livestock size, with resultant range deterioration.

For many years, African livestock production was seen as a poor investment for development. Today, however, a new ‘livestock revolution’ fuelled by massive growth in global demand for food of animal origin is foreseen. According to Scoones and Wolmer (2006), the livestock sector in the developing world is growing at a rate of up to seven per cent (7%) per annum, much faster than the agricultural sector as a whole and by 2020 it is predicted to become the most important sub-sector in terms of added value. They argue that Africa can, and should capitalize on its enormous wealth in livestock and gain access to new markets opening up. The New Partnership for African Development (NEPAD, 2005) similarly made a case for investments in rural infrastructure to underpin market access and the sustainable development of livestock resources.

More specific assessments of the African livestock sector (Scoones and Wolmer., 2006) have highlighted the need for a pro-poor livestock development focus – relating to the increasing emphasis on the role of greater market access for agricultural products from the developing world as a pathway out of poverty. Contrary to the belief that pastoralism causes overgrazing, there is little evidence that dryland pastures are generally over-stocked or overgrazed (UNDP, 2012). In fact, much more pasture degradation is evident in areas around permanent settlements than in open rangelands where mobile pastoralists seasonally move their herds to allow pastures to regenerate (Hodgson., 2015).

In *Shinile* zone, prior to the 1970s for instance, distinct dry-season and wet-season grazing areas were evident, and pastoralists moved seasonally between them. As a result of proliferated settlements caused by population growth, today pastoralists are not able to pursue traditional

uses of the natural resource base. This has often led to fierce and fatal resource use conflict between the pastoralists and other land resource users. The area's dry-season and wet-season patches no longer exist, greater areas of *Afdem* district are barren and pastoralists have to move long distances to access pasture (Esayas., 2007).

2.2. Characteristics of a Pastoral System

Pastoralism as an economic activity is identified on the basis of characteristics that distinguish the sector from others. Several works on pastoralism in the Greater Horn of Africa (GHA) are grounded on one or more of these characteristics to describe the behaviour of pastoral societies in response to changes in socio-economic and ecological environment (PFE, 2012). The characteristics that delineate the pastoral sector in the GHA region that are of particular relevance to coping and adapting strategies among pastoral households are discussed in the subsequent sub sections.

Pastoral systems are important to global society as they support herders' subsistence, provide large quantities of food and non-food products (which play a major role in ensuring local food security), and contribute significantly to the national economies of poor countries (Nori and Davies., 2008). These contributions accrue from areas where soil, rainfall and temperature conditions provide limited effective options for alternative land uses.

2.2.1. The Pastoral Environment

The physical environment inhabited by the pastoral communities is an important characteristic of the pastoral system. Pastoralists usually occupy arid and semi-arid environments. According to UN-OCHA (2011), the GHA countries are among the thirty-six countries in which most of the land is characterized as arid and semi-arid. These arid and semi-arid environments are characterized by extreme variability and unreliability of rainfall both in space and time (Mortimore., 2010). Consequently, these areas are also characterized by the scarcity and seasonal variability of vegetation, and vulnerability to drought.

Pastoral areas are generally marginal to intensive crop production. This makes livestock production appear to be the only viable and rational option under the existing technologies. Nonetheless, this marginal nature of the physical environment still imposes certain constraints to settlement patterns and livestock production. In the context of drought and recovery strategies, Hogg (1997a) indicated some five implications of the physical characteristics of the pastoral environment.

To begin with, resilience to drought and disease determines livestock assembly than efficiency. As a result, pastoralists tend to maximize number than productivity per head, contrary to what the mainstream livestock development discourse suggests. This is due to the fact that more productive species may be more vulnerable to starvation than poorly productive animals.

The second implication that comes out of this arid and semi-arid environment is mobility. This is a vital response to the spatial effects of the variability of rainfall on fodder and water. Pastoralists will always be moving in search for better pasture and water. Thirdly, diversification of herds is commonly practiced to mitigate the vagaries of this marginal ecological resource. Fourth, herd growth “tends to be opportunistic rather than conservative”. This situation forces pastoralists to adopt the “strategy of tracking grazing availability” rather than “restricting herd numbers” as per their resilience to drought. As a result, “in good years, livestock numbers will increase only to crash in bad years”. Finally, communal ownership of the rangeland is instituted, which otherwise limits access to a wide variety of potential grazing areas.

2.2.2. Reliance on Livestock

The most basic characteristic of pastoral societies is their orientation toward livestock grazing on natural pasture. In any pastoral household, the income is generally derived from specific economic activities, livestock and livestock related activities being the most important contributors (Hogg., 1997a;). This basic feature of a pastoral household suggests some implications on household’s capital accumulation behaviour under the circumstances. In this regard, Hogg (1997a) identified the four important consequences.

First, pastoral capital can reproduce itself without intervention of any market mechanism. Therefore, unless herd owners have viable alternative forms of investment, the tendency is for pastoralists to re-invest in herd growth. One of the inevitable consequences of this situation is that, other things being equal, livestock populations will eventually exceed the capacity of the range. Secondly, because pastoralism is geared towards herd reproduction, there will inevitably be a surplus of animals that can be disposed of without affecting the reproductive capacity of the herd. Thirdly, unlike the case for cultivators, post-drought recovery among pastoral households is a long and slow process because herd re-constitution after drought is a long and slow process.

2.2.3. Separation

Although there are commonalities in some respects, pastoral groups are separated along certain variables, for example, by their geographical location and ethnic background. The concept of separation generally emphasizes that not all pastoralists in Sub-Saharan Africa or in the GHA face the same kind of lifestyle and environmental constraints, and hence there is clearly a need to distinguish more among different types of pastoral communities in designing policy and interventions, rather than just referring to a “homogenous” group of “African pastoralist” (Hadush., 2014).

It is important to note that while there are many similarities in the types of stresses and adaptive strategies faced, there are also significant differences which affect their livelihoods. Some of the communities are migratory, while others are transhumant pastoralists, settling in their villages for part of the year and moving with their herds as the seasons and availability of water and grazing for their livestock demands.

2.2.4. Physical Location

The pastoral land is known for its harsh environment where communities strive to secure water and pasture on which their main livelihood source, livestock, depends. This makes them reliable on natural and climatic aspects especially rainfall, and vulnerable to weather variations such as heat and wind. Over thousands of years, pastoralists have managed their resources and livelihoods in the face of environmental challenges and difficult socioeconomic conditions (Kidane., 2014).

Different pastoral groups especially in the GHA region are found adjacent to each other and in most cases in peripheral areas of their respective countries. This arrangement would entail some important implications. One is that the traditional production system requires periodic mobility, including cross-border mobility, in search of pasture and water. Several cases can be sighted. For example, the Karamoja cluster of pastoralists including the Karamonjong of Uganda, Turkana of Kenya, and pastoralists from southern Sudan; and southern Ethiopia, often cross national boundaries in search for pasture and water (FAO, 2011). However, the situation in the Horn of Africa is becoming increasingly difficult due to several factors including political instability. Another implication of this geographical location is that localized droughts have a potential to spill over into other groups of pastoralists as affected groups tend to migrate with their animals and create pressure on pastoral resources in other places (UNDP, 2012).

2.3. Drought: Its Role and Impact on Pastoralists

2.3.1. Drought Explained

Drought is notoriously difficult to define and different definitions abound. However, according to Angassa and Oba (2007), a generally accepted definition of drought is a temporary reduction in water or moisture availability significantly below the normal or expected amount (norm) for a specified period. The key assumptions of such a definition are (1) that the reduction is temporary (if the reduction were permanent then terms such as “dry” and “arid” would be more appropriate); (2) the reduction is significant; (3) the reduction is defined in relation to a “norm” i.e. “Normal Expectation”; (4) the period taken as the basis for the norm is specified. How the “norm” is defined is of critical importance. Assumptions 3 and 4, therefore, require more detailed clarification.

The “norm” may be defined either technically or culturally, thus: Technically – a reduction of water availability might qualify as a “drought” when two or more consecutive dry years occur in which the length of the growing period is less than 75% of the mean, i.e. a drought is driven by several consecutive rainy seasons in which deficient rainfall has detrimental effects on the production system (Lekapan., 2013). Culturally – in terms of the level of water availability the society has come to expect. Thus, after a run of ten years with above average rainfall a society may have become used to the wetter state and perceive the first year of average rainfall as a drought.

Many researchers have intimated drought as a progressive phenomenon rather than a singular occurrence. Nessef (2009) noted that designation of drought as a one-year event was inconsistent with other findings in which drought was observed as a multi-year phenomenon. Fluctuating rainfall and the occurrence of drought are accepted as inherent features of arid and semi-arid lands in general and pastoral areas in particular. Drought, as a natural hazard, for many years has been the subject of inquiry by scientists from various disciplines and professions (Angassa and Oba., 2007).

Definitions of drought, has been dominated by focus on differing nature of need for water or moisture. A simple definition addressing failure of the rain in its normal season has gone through various modifications. Several terms and definitions for drought include meteorological drought, agricultural drought and hydrological drought.

Meteorological drought is defined “solely on the basis of the degree of dryness (often in comparison to some normal or average amount) and the duration of the dry period” and must be region-specific (Field., 2005).

Agricultural drought focuses on factors such as differences between actual and potential evapotranspiration and soil-water deficits. They are crop-specific and depend heavily on the timing of rain and dry periods relative to crop-cycles (Birch and Grahn., 2007). Agricultural droughts can, therefore, occur in the absence of meteorological drought, and vice versa.

Pastoral drought could be defined as lack of forage availability as a result of particular sequences of meteorological drought, in terms of length, seasonal timing and the intensity of the deficit (Field., 2005). Definitions will need to take into account the differences between areas of bimodal rainfall (as with many but not all of the pastoral areas of east Africa) and of mono-modal rainfall (as in the Sahel), but for some areas it has been suggested that pastoral drought be defined in terms of rainfall failure in two successive years.

The World Meteorological Organization (WMO) (quoted in FAO, 2002) proposed two definitions for drought: Prolonged absence or poor distribution of precipitation; and Period of abnormally dry weather sufficiently prolonged for the lack of precipitation to cause a serious hydrological imbalance. United Nations Convention to Combat Desertification (UNCCD), in its Article 1, quoted in FAO (2002) gave the following definition: “Drought” means the naturally-occurring phenomenon that exists when precipitation has been significantly below normal recorded levels, causing serious hydrological imbalances that adversely affect land resource production systems.” It further gave the following definition for a measure relating to drought: “Mitigating the effects of drought means activities related to the prediction of drought and intended to reduce the vulnerability of society and natural systems to drought as it relates to combating desertification.”

2.3.2. Drought as a Meteorological and Ecological Phenomenon

Drought may be defined either in narrow meteorological term, in relation to expected rainfall, or in terms of impacts on potential vegetation growth (accounting for a wider range of climatic and soil factors affecting moisture availability). In meteorological terms, annual drought (the failure of two successive rainy seasons) may occur between 6 in 8 years; and 3 years in 4 years, in areas such as south eastern Ethiopia (Deveruex., 2006). Apart from climatic conditions, a number of additional factors influence the availability of grazing areas.

These include first the interaction of climate and livestock in preceding years (the sequences or mixtures of high and low rainfall years). Thus as livestock populations change through high or low rainfall periods so do grazing requirements and the impacts of subsequent reduced rainfall (Swift *et al.*, 2002).

2.3.3. Drought as a Physical Event and as a Social Construct

Drought is commonly regarded as a physical event consisting of some degree of shortfall in rainfall over a period of time. This in turn affects the level of primary production of plants (grasses, trees and crops), which support livestock and human populations. Petheram (2010) for example, indicated the misconception that “the monitoring, measuring and modelling of climate is usually conceptualized as a technical matter left to meteorologists and distinguished from the realm of both policy and crisis management.

2.3.4. Droughts in Ethiopia

Ethiopia is among those countries most vulnerable to climate risks in Africa. Its high vulnerability derives in large measure from the country’s heavy dependence on rain fed, subsistence agriculture. Drought and climate variability are part of the natural cycle in lowland Ethiopia, and pastoralist communities do have an array of traditional coping mechanisms and resiliencies. However, the increased frequency of extreme weather and droughts threatens to overwhelm these economic and social coping mechanisms and resiliencies.

A study by Hadush (2014) involving Somali pastoralists in *Geladi* Woreda has revealed that the actual length of the rainy season is getting shorter and shorter through time. Similar trend of declining length of rainy seasons is being reported in many other low land areas (ex. Deveruex., 2006) and climate change is to be implicated in this regard. The frequency of drought is viewed as increasing particularly over the past two decades. Except in more dry years, changes in the seasonality, distribution and regularity of rainfall were more of a concern than the overall amount of rainfall. The main rainy season is also seen as becoming progressively shorter – it now starts later and finishes earlier than it used to be – and the rains in general are becoming more unpredictable.

The eastern lowlands of Ethiopia are vulnerable to drought and there have been notable droughts in this part of the country throughout human history (Ruijs *et al.*, 2011). Previous droughts and the frequency of rainfall deviation from the average suggest that drought occur every 3-5 and 6-8 years in the arid and semi-arid regions and particularly Somali region of Ethiopia and every 8-10 years for the whole country (Deveruex., 2006).

Many (including Haile *et al.*, 2005) believe that Ethiopian drought is caused by El Niño-Southern Oscillation (a coupled air and ocean phenomenon with global weather implications), along with sea surface temperature anomalies in the Southern Atlantic and Indian Oceans combined with anthropogenic activities affecting rainfall distribution and temperature conditions in Ethiopia by displacing and weakening the rain-producing air masses and raising surface temperature. Drought has thus been widely recognized as a major climatic hazard and a key development and environmental challenge in the Somali Regional State of Ethiopia.

If asked, Somali elders can easily make lists of major droughts over the past 30–50 years, with detailed accounts of the effects and implications. While opinions vary on the severity and frequency of drought in the historical past, recent reports and community opinions show that drought hazards have increased in frequency, intensity and magnitude over the recent decades and have adversely impacted on food, feed and water security and the sustainable livelihoods of Somali pastoralists. In Somali regional State, drought occur if the main rainy season (locally known as the *karan* season which fall from July to September fail, and if both the *Karan* rainy season and the two short rainy seasons (*Gu* in December and *Dhira* from March to April) fail the resulting prolonged dry season can give rise to severe drought conditions. The Somali communities have seen more frequent and catastrophic droughts during the last decades' years (SDPPB, 2012).

2.3.5. The Impact of Drought in Pastoral Areas

The term drought always has a negative connotation in the minds and understanding of the general public. This is true because drought does have a lot of negative impacts and more so in the pastoral areas. However, it is important to note that it is not absolutely negative in its contribution. It plays a major role in pastoral areas.

According to Lepakana (2013) such roles can be understood in the following context: “It is the mechanisms by which balance is maintained between humans, herds and pasture; and the descriptions of the management and husbandry decisions of individual stock-holders.” Most definitions view drought simply as an event concerned with lack of water, usually as a result of rainfall failure. For the victims of drought, however, the gravity of a drought is not only related to the incidence of rain, but also depends to a greater extent on the availability of other supplementary resources. Of greater importance among pastoral people is the period of recuperation from drought which may be much longer than the return of the rains would suggest (Nessef., 2009).

In the pastoral context therefore, drought should not be seen as some external event, alien to the experience and working of the pastoral economy but rather as an element within the production system itself, around which producers orient their activities, determining forms of organization and strategies to be followed (Nessef., 2009). An understanding of the behaviour and strategies of pastoral communities should, therefore, be based on recognizing that the society places much more emphasis on mitigating the effects of downswings in economic fortune than in getting the most out of the upswing (SC-UK, 2010).

Somali region as other parts in the GHA region suffers from the effects of extreme weather events. According to FAO (2011), a big part of the region's population lives on less than one United States Dollar (1US\$) a day. Drought and conflict are identified as the main causes, which often exacerbate the problem of food production, distribution and access within an already difficult environment of fragile ecosystems, poor economic performance and governance. Two main processes challenge the pastoralists during drought that adversely affect their capacity to support themselves, effectively raising the minimum herd numbers required to maintain the household.

First is a fall in levels of productivity from their herds following losses in their livestock capital from higher mortality rates, low calving rates, reduced production of milk and weight loss in animals that reduces their market value. For instance, In the pastoral areas of Ethiopia, drought invariably resulted in livestock death. Accordingly, the Somali Region Disaster Prevention and Preparedness Commission (SDPPB, 2012) reported a huge loss of livestock during the 2010/11 drought. It also left more than 40% of the pastoral households with food insecurities and destitute. Environmental degradation in general and drought in particular, seem to erode the traditional coping mechanisms of pastoralists.

Secondly, during droughts, pastoralists are usually faced with changes in terms of trade that adversely affect the purchasing power represented by their herds. This is because where drought conditions also touch the farming sector; there will be a reduced quantity of grain available to be marketed. Moreover, demand by farming communities for livestock products is likely to fall, due to reduced productivity in the agricultural sector as a result of drought and poor condition of animals coupled with the relative fall in income and demand for livestock products such as milk and meat, in contrast to grain.

Drought impacts, therefore, depend on the severity of drought in meteorological and ecological terms, the recent history of drought events, and the underlying resilience of the pastoral system. Prolonged drought and erratic rainfall can cause serious range degradation. During the drought periods, the rainfall is generally inadequate to allow growth of forages (Kidane., 2014.) and to fill the surface water ponds.

Dependence on groundwater will increase during dry periods and sources will become strained after prolonged periods of drought. Agricultural drought will be experienced as soil moisture is diminished, resulting in crop losses. Additionally, natural shrubbery will begin to exhibit effects of soil moisture depletion, reducing the available grazing land for pastoralists and their livestock. With a limited water supply, the health and quality of livestock will begin to suffer, diminishing their value. This will affect market prices and corresponding income due to livestock sales. All of these results will affect the local population, which may eventually be displaced from their land in search of other opportunities.

Drought has an effect on the natural environment and causes ecological changes. A study done by Moore et al. (2012) concluded that food security and crop yield in general, is very vulnerable to climate change mainly due to the corresponding effects on land use and land cover changes. They noted that land use and land cover change primarily drive food production risks and drought negatively affects land productivity. They also noted that there will be impacts on other human systems such as water availability and livestock health. There is a strong correlation between rainfall and livestock dynamics. It has been shown that times of drought, calving rates and animal mortality rates will be affected (Huho and Mugalavi., 2010).

2.4 Adaptation and Coping Strategies among Pastoralists

Of all the natural resource based land uses in the dry land, pastoralist functions better within the context of wide rainfall variability and unpredictability. This is because it presents a more logical adaptation route than other livelihood activities and land uses which do not have the advantage of mobility (Anderson *et al.*, 2009). Pastoralists therefore employ various coping and adaptation strategies to deal with climatic shocks like droughts.

The Intergovernmental Panel on Climate Change reports (IPCC, 2012) define adaptation as an adjustment in natural or human systems in response to actual or expected climatic stimuli or their effects, which moderates harm or exploits beneficial opportunities. Adaptation therefore involves adjustments in reducing the vulnerability of households to climatic variability and change. On the other hand, (Moreton J. *et al.*, 2010). Defined coping as the manner in which people act within existing resources and ranges of expectation in a given context to achieve various ends. Therefore, adaptation involves longer-term shifts in livelihood strategies, while coping involves temporary adjustment in response to change or to mitigate shocks and stresses on livelihoods.

2.4.1. Pastoral Adaptive Strategies

Adaptive capacity is usually defined as the ability of a community (or social system) to withstand environmental changes. Some authors underlined that a community with generally high adaptive capacity will be less vulnerable in the future than other communities to the potentially detrimental (and often unpredictable) effects of climate change (and other stresses) on their landscape and lives (Petheram *et al.*, 2010). In short, adaptation to climate change in this research is understood as adjustments by community and individual to respond to the changing of climate over time in order to moderate negative impacts or enhance adaptive capacity of community and individual.

Understanding adaptation concepts is important to make the foundation for evaluating and identifying impacts of recurrent droughts as well as choosing the appropriate adaptation measures in order to decrease negative climate changes impacts, reduce significantly vulnerability and risk for human, environment and nature in climate change context. Pastoralists as a matter of necessity have for many years developed a number of drought coping mechanisms, which for many years have enabled them to live through drought events (SC-UK, 2010).

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A. Mobility

In the arid and semi-arid region, livestock production requires constant or periodic movement in search of pasture; a factor that differentiates this form of livestock production from those practiced by farmers and ranchers (Morton J., 2010). Movement of animals in response to spatial and temporal variation in resource availability is perhaps the most classic of all the tracking strategies, and is central to survival strategy of transhumant pastoral systems (Agrawal., 2010).

Mobility is the basis of the traditional adaptation long-term strategy, based on opportunistic movements within and across geographically distributed grazing units, which are composed of those households that depend on common permanent water sources (Angassa and Oba., 2008). It is perhaps the most common and seemingly natural response to environmental risks which pools and distributes risks across space, and is “especially successful in combination with clear information about the spatial and temporal distribution of precipitation” (Agrawal., 2010).

B. Herd Diversification

Livestock Diversification: Herd diversification is a common adaptation strategy practiced by most pastoralists in Africa. The objective of herd maximization is best realized through herd diversification. Several types of animals are maintained to secure survival of pastoral households. The use of different livestock species has ecological and economic implications. Different species fill different ecological niches and therefore may be more efficient than a single species. Ethiopia pastoralists who practice according to Dula (2013) include the Kuraya, Somali, and Borana and Afar communities. Therefore, sheep and cattle those are more sensitive to drought, whereas goats, donkeys, and camels that are more resistant to drought-induced stresses are diversified and reared together (Redwan., 2014).

C. livelihood Diversification

In response to a rapidly diminishing rangelands resource base and the continued fall in animal productivity, pastoral households suddenly find themselves in a situation where they have to seek alternative forms of livelihood to sustain their families. This situation has forced pastoralist so seek temporary income and subsistence bases in order to put food on the table and supplement the falling supply of animal products (UN OCHA, 2011). The nomadic population has embraced livelihood diversification in order to adapt with drought stresses and includes a wide variety of alternative income generating activities; the collection of firewood,

charcoal burning, and collection of gum Arabic among other activities. Like other Pastoralists, Pastoralists in the lowland part of *Godey* woreda according to Alibashi (2016) do engage in different livelihood diversification choices to include aloe production and wage employment.

D. Livestock take-off

Livestock Takeoff by selling occurs at different stages for practicing as a long-term adaptation practices or short-term drought response among Ethiopian and Kenyan pastoralist. According to Raphael P. (2016) the livestock herders in Pokot county of Kenya regularly sell their livestock to meet family demand in times of drought. This dependence is exacerbated and accelerates the process of economic differentiation within the society. Another study conducted in Kuraya pastoral communities has also indicated that selling of livestock during and before is becoming as a long-term adaptation practices across the different pastoral communities (Dula., 2013). Selling of livestock can also be a "emergency responses" or "fallback mechanisms" of people in normally secure livelihood systems that are experiencing abnormal risk to cope with food shortage during and after drought (Deveruex., 2006).

E. Tackling of Livestock diseases

The current climate variability and extreme events are adversely affecting the livestock sector, directly and indirectly by aggravating the prevalence of diseases, distorting production and minimizing the sector's profitability (Thornton and Gerber., 2010). Major livestock diseases in pastoralist areas include those caused by *trypanosomiasis*, *bendoparasites* particularly *Haemonchus contortus* and the highly zoonotic *hydatidosis* caused by *Echinococcus granulosus*. Other diseases include dermatitic, ectoparasite-related ailments such as *orthopox*, and *tick-borne* diseases caused by *Hyalomma*, *Rhipicephalus* and *Amblyomma* species are very common (Huho, J.M. *et al.*, 2011).

F. Sedentarisation (Agro-pastoralism)

In spite of pastoral areas' huge resource potential and significant contribution to the national economy, the pastoral (livestock) production system is under serious pressure and is unable to adequately support the livelihood of the majority, particularly the poor and very poor segments of pastoralists (Hodgson., 2015). While some pastoralists in the system are choosing to continue their way others are voluntarily engaging sedentarisation.

2.4.2. Coping as Short-Term Strategy

Coping mechanisms are responses of an individual group or society to challenging situations (Opiyo *et al.*, 2014). The coping mechanisms lie within the frame work of the individual's, group's or society's risk aversion or tolerance level, i.e. are institutes to minimize risk or to manage loss. While some coping mechanisms may be brought into play by stress factors, others may be an intensification of an already in- built strategy.

Coping strategies are bundle of people's responses to declining food availability and entitlements in abnormal seasons or years. Coping is thus defined as a short-term response to an immediate and in-habitual decline in access to food, and means acting to survive (Moreton J. *et al.*, 2010). Coping strategies are characteristically "emergency responses" or "fallback mechanisms" of people in normally secure livelihood systems that are experiencing abnormal risk.

Opiyo (2014) have classified the above coping strategies to be either proactive and reactive strategies. These proactive coping strategies is taken to reduce the impact of the anticipated droughts and includes increasing pack animals, making ghee for dry seasons, purchasing of grain, collection and conservation pasture, While the reactive coping strategies is often practiced during and after drought events and includes slaughtering of weak animals, herd and family splitting, selling the livestock asset and managing the food consumption of the households.

Herd/House hold splitting: During the dry season, nomads do divide their herds to smaller and smaller groups to find pasture (Redwan., 2014). Families too are separated; other animals with families remain along the rivers in the plains especially with camels, sheep and goats because they do not move to further mountains while cows with other family's members move far towards the mountainous region. Herd splitting is done by nomads to maximizing use of scarce range resources.

Livestock sales: In any pastoral household, the income is generally derived from specific economic activities, livestock and livestock related activities being the most important Contributors. According to Redwan (2014) studies, pastoralists do sell their livestock to cope with drought. These practices could be to breed more females than male as male livestock are the ones usually sold. However, common practices during drought period according to Hadush (2014) are that animal's prices do get low and are bad body conditions or emaciated and nomads try selling more male animals.

Selling of livestock can also be a "emergency responses" or "fallback mechanisms" of people in normally secure livelihood systems that are experiencing abnormal risk to cope with food shortage during and after drought (Deveruex., 2006). Additionally, drought time livestock sales are characterized by low prices and poor livestock body condition.

Managing food consumption: In the face of drought and severe dry conditions, households adopted consumption smoothing mechanisms. Deveruex (2010) states that, there is clear evidence that food consumption falls in spite of coping mechanisms that communities adopt, to an extent that some family members become vulnerable and in need of relief assistance. One indication was that during the drought year, households sharply reduced the frequency of meals.

Households faced with a livelihood shock that weaken their access to food react in a number of ways. Accordingly, pastoralist communities of Somali region respond to food shocks through 'protected consumption' and 'modified consumption'. Protecting consumption requires buying or being given food to maintain food intake levels. Modifying consumption includes reducing or diversifying consumption, or 'reducing consumers' by migrating or sending some household members elsewhere. (Devereux., 2006)

Consumption of wild fruits: Consumption of wild fruits is also another one of the short-term food coping among many pastoral households which are facing food shortages due to the drought severity. For example, among *Shinile* zone pastoralists, the first coping option available to the poor and the destitute is wild food then social supports from their communities and food aid from external sources. Whereas, medium and rich categories of the society have the options of selling small ruminants and cattle and less likely look for social support and food aid (Mulu., 2010).

Charcoal and firewood collection: To respond to the harsh climatic realities with frequently occurring droughts, Somali pastoralists have been practicing the collection and production of firewood. Mulu (2010) wrote that production of charcoal was mainly involved by men while women are engaged the collection and sale of firewood while. But for those PAs that are far away from cities both the firewood and charcoal are sold by men. Somali pastoralist charcoal Production has been increasing for past fifteen years (Abdi., 2014). This is due to the recurrent drought which lowered the livestock production in Somali region.

Re-stocking: Restocking involves the provision of livestock to families, who have lost their herds, usually as a result of drought, disease, or conflict and is mainly practiced as a recovery strategy only. The practice is mainly in the post drought period. It is normally complemented by food ration to sustain the lives of restocked until they start to reap the proceeds of their livestock (Alibashi., 2016). The pastoralists prepare for drought and epizootics by “lending” their animals to relatives or friends in exchange for looking after some of their animals in return.” It also became clear that cattle-raiding in some places is “one method of restocking a herd.”

Moreover, having **clannish and kinship lineage** in many nomadic pastoral settings do help a lot; Hadush (2014) elaborates that these practices do promote animals sharing between families for the purpose of subsistence and reproduction. This shields the poorer households from effects of droughts while the wealthier ones spread the risk during the dry period. This practices though cuts across all the nomadic population. Lekapana (2013) suggests it is widely practiced in Samburu, Rendille, and Turkana and Gabra pastoralists.

Relief food, currently a popular form of outside assistance to drought-afflicted pastoralists, has also come to be treated as a food shortage coping response. Somali region pastoralists consider acquiring relief food as a new economic activity. The benefits of relief food, other than relieving hunger, have enabled herd owners to minimize offtake from their herds (Devereux., 2006). But provision of relief food is a self-perpetuating ‘solution that, once started, is difficult to abandon. This realization explains why long term rehabilitation and redeployment of destitute nomads have gained wide support in recent years (SLCRDB, 2014).

3. MATERIALS AND METHODS

3.1. Description of the Study Area

3.1.1. Location

This study was conducted in *Shebelley* woreda and it is one of the three newly formed districts in the *Fafan* zone of the Somali Regional state, Ethiopia. The *Shebelley* district borders with the *Jigjiga* city council to the north, the *Fik* zone to the south, the *Qoran* Mulla to the south-east, and *Gursum* district to the west. It is located 630 Km east of Addis Ababa and at about 40 Km from *JigJiga* city council.

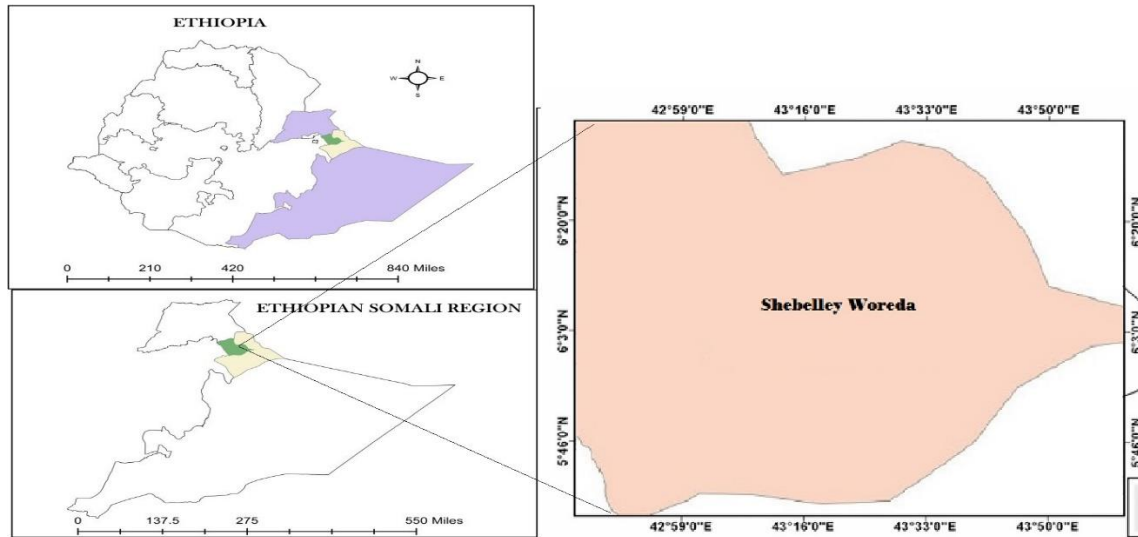


Figure 1: Map of the study area

3.1.2. Agro-Ecological Zone

The District is semi-arid district with altitude of between 950-1300 meters above sea level. The rainy season of the area is bimodal which are *-Dira'* and *Karan*. The *Dira'* which is the short-rainy season in Fafan and Shinile zone falls between late March and late May while the *Karan* season which is the main rainy season is between late July to late September. Annual average rain fall and the average temperature of the area are between 500-600mm and 27.50c respectively. The mean monthly minimum temperature varies from 5.8⁰C in November to 14⁰C from July to September and the mean monthly maximum temperature varies from 25⁰C in July to 29⁰C from March to April (SLCRDB, 2014).

3.1.3. Livelihood System in *Shebelley* District

Around 90% of *Shebelley* district inhabitants depends on livestock and livestock products for their livelihood and the rest, 10% are engaged agro pastoralism (both annual and tree crops), livestock production (SC-UK, 2010).

Livestock plays a significant role in the pastoral production system in the study area. Livestock types kept by the *Shebelley* pastoralists includes; camel, cattle, sheep and goats. Camels are kept for milk and meat, sale transportation and for social status, cows provide for pastoral households with milk and butter for consumption and sale, donkeys for transporting goods such as to transport collected firewood to the urban centres for selling, while sheep, goats are mainly kept for sale as well as for their meat. The feed sources commonly used for livestock include communal and private rangelands in the area.

Table 1: Livestock Population in *Fafan* Zone

Type of animals	Number of livestock
Cattle	368,156
Sheep	972,528
Goats	747,685
Horses	-
Mules	-
Donkeys	70,913
Camels	87,835
Poultry	14,331

Source: *CSA livestock report, 2012/2013*

Sale of livestock is the main sources of income; camel rent is also important for wealthier households. But there is little demand for milk due to poor access to few urban and market centers; when abundant, much is consumed and given as gifts. Wealthier households use most of their cattle to make ghee. In dry season, the herd is divided into smaller groups, with sheep and milking animals staying with the core family(*xaas*) near villages, while hardier animals (cattle, camel and goats) are driven to further afield in search of water and pasture. In rainy season all livestock remains around the homesteads (SLCRDB, 2014).

3.2. Research Design

The research design used in this study was cross-sectional type. Both qualitative and quantitative data was used to combine and to identify drought coping and adaptations strategies used by the *Shebelley* pastoralist. Long-term precipitation dataset was used to identify drought frequency and severity in the study, while field interviews were conducted with household respondents using semi-structured questionnaires. To generate the qualitative data, key informant interviews and focus group discussions were conducted.

3.3. Sample Size Determination

There are several approaches to determine the sample size. These include using a census for small populations, imitating a sample size of similar studies, using published tables, and applying formulas to calculate a sample size. This study applies a simplified formula provided by Yamane, (1967) to determine the required sample size at 95% confidence level, degree of variability = 0.5 and level of precision =9%.

$$n = \frac{N}{1 + N(e)^2}$$

Where n is the sample size, N is the population size (total household size), and e is the level of precision. The total population size is 3000 from four *Kebeles*.

$$3000/1+3000(0.09*0.09) = 119$$

The above formula requires a minimum of 119 households but, 120 households was used for this study just for simplicity.

3.3.1. Sampling Techniques

To achieve the objectives of this study, purposive and random sampling techniques was implemented. First, 4 Kebeles out of the 16 pastoral Kebeles in the district were purposively selected and the selection was based on their pure pastoralism, since the rest Kebeles are agro-pastoralist. Secondly, a total of 120 households was randomly selected by using a semi-structured questionnaire from respective list of pastoralist in the 4 Kebeles using probability proportional to sample size and sampling techniques. Selection of starting point from the pastoralist' list was taken by a lottery method. Then, respondents were selected by a fixed interval until the desired sample

size is obtained. The pastoral *Kebeles* with their respective sample size is written below.

Table 2: Pastoral *Kebeles* with their number respective sample households

Pastoral Kebeles	Total number of pastoral households	Sample household
<i>Garsalley</i>	950	38
<i>Bula Dari</i>	800	32
<i>Hora Hawd</i>	750	30
<i>Dusha</i>	500	20
Total	3000	120

In addition to this, detailed interviews with 8 key informants from various organizations and 4 focus group discussions (FGDs) was conducted separately with equal gender participation from the sampled households.

3.4. Instruments for Data Collection

3.4.1. Questionnaire

A semi-structured questionnaire with multiple-responses and dichotomous questions was used to collect data. It was prepared in English, and then, it reached to the respondents after it was translated into Somali because the respondents were speakers of Somali language. The questionnaire was collect data on aspects of socioeconomic characteristics of households, which include gender, education, and age of the respondent, household size, source of livelihood, livestock ownership and production, information on climate, and their perception toward droughts. In addition, data was gathered on aspects of drought impacts and household adaptation and coping strategies. For the reliability of the questionnaire, a pilot test was conducted before it was entered in to operation. Therefore, it was tested by ten respondents. The main concern of the pilot survey was to detect problems which may cause confusion to the respondents, which helps to identify ambiguous items in the questionnaire and to improve the format of the questionnaire to facilitate understanding.

3.4.2. Key Informant Interview

By using pre-designed questions, Key informant interviews were conducted. Key informants are individuals with whom the researcher begins in data collection because they are well informed, are accessible, and can provide leads about other information (Creswell *et al.*, 2007). Key informants were included community elders, personnel from governmental offices, religious and clan leaders and non-governmental organizations (NGOs). They also included extension workers, local administrators, decision-makers and leaders of relevant NGOs. Key informant interviews are appropriate for generating information and ideas in situations when general descriptive information is needed, and when understanding of the underlying motivations and attitudes of a target population is required. It is argued that key informant interviews can help determine not only what people do but why they do it.

3.4.3. Focus Group Discussions

Focus group discussions with community leaders, elders and experienced pastoralists was carried out using guide checklist questions so as to explore local knowledge practices in drought adaptations and coping strategies used by the *Shebelley* pastoralist. A total of four focus group discussions were carried out in *Garsalley*, *Bulla Dari*, *Dusha* and *Hora Howd* Kebeles.

Focus group discussion was used to complement the information obtained from the key informant interviews. Focus group participants were selected based on their role in the community, their acceptance with community and their knowledge of the culture and social organization of the community. Information about the participants was acquired from different angles. For instance, while conducting key informant interviews, informants were asked to tell me any other individual whom they think is capable of explaining and has a vast knowledge on the issue at hand.

This technique may be similar to what Elliot J. (2005) calls snowball sampling, which is a sampling technique used to identify cases of interests reported by people who know other people involved in similar cases. In focus group discussion, individuals who were key informants were not included. This helped to avoid the redundancy of information from the same individuals and to find new information from new participants.

3.5. Rainfall Data

Rainfall was used to delineate droughts since it is the one of the most climatic parameter that affects pastoralist in the study area. Annual rainfall totals for a period of 36 years was obtained from National Meteorological Agency (NMA). The standardized precipitation index (SPI) was used to analyse drought frequency and severity. The SPI was calculated for 12 months (M12) for the period between January 1980 and December 2015. In the analysis, negative values of SPI was considered to represent dry periods and positive values reflect wet periods. The SPI has been used previously in Kenya (Huho and Mugalavai., 2010) to examine drought severity.

The SPI is computed by dividing the difference between normalized seasonal precipitation and its long-term seasonal mean by the standard deviation as follows:

$$SPI = \frac{X_{ij} - X_{im}}{\sigma}$$

where σ is the standard deviation, x_{ij} is seasonal precipitation at the i th synoptic station, x_{im} is long term seasonal mean precipitation. Meteorological drought was considered to have occurred when the SPI value is negative and ended when the value became positive. Droughts was categorized as mild, moderate, severe and extreme as indicated in the following Table 3.

Table 3: SPI Drought categories

SPI Value	Drought Category
0 to -0.99	Mild drought
-1.0 to -1.49	Moderate drought
-1.5 to -1.99	Severe drought
<-2.00	Extreme drought

3.6. Data Analysing

The 36 years of rainfall data obtained from the National Meteorological Agency which was daily precipitation record was rearranged into monthly precipitation by using excel programme (version 2016). First, to identify the rainfall variability, rainfall trend of last 36 years in *Shebelley* district was established and then standardized precipitation index (SPI) was used to identify drought frequency and severity. The SPI was calculated for 12 months (M12) for the period between January 1980 and December 2015. Further analyse of 3 months of SPI scale was conducted to examine drought characteristics of short rainy season (*Dira* ') and the long rainy season (*Karan*) in *Shebelley* area. In the analysis, negative values of SPI was considered to represent dry periods and positive values reflect wet periods.

The collected data through questionnaire was coded and analysed using Microsoft Excel sheet. Indigenous adaptations and coping strategies used and the type of constrains they are facing were summarized in frequency and percentage tables, charts and graphs to facilitate description and explanation of the study. Data collected through key informant interviews and the focus group discussion were analysed in a form of narration to support the quantitative data.

4. RESULT AND DISCUSSION

4.1. Demographic and other Characteristics of the HHs

Dealing with the background information of the pastoralists was very useful before proceeding to the main body of the discussion part, since it supports the researcher to reach in sound conclusions as it can portray the capacity, ability and efficiency of the pastoralists under the climate change i.e. droughts. The following Table (4) summarized the demographics of the surveyed pastoral households in *Shebelley* district.

Table 4: Demographic characteristics of the HHs

Demographic Variables	Respondents	
Sex	<i>Frequency</i>	<i>Percentage (%)</i>
Male	67	56
Female	53	44
<hr/>		
Age grouping		
25-35	35	29
36-45	51	43
46-55	20	17
56-65	12	10
> 65	2	2
<hr/>		
Marital status		
Married	102	85
Single	9	8
Divorced	4	3
Widowed	5	4
<hr/>		
Educational Status		
Illiterate	46	36
Elementary 1-4	34	28
Primary 5-8	19	16
Secondary 9-10	7	6
Preparatory 11-12	0	0
Diploma	1	1
Qur'anic school	15	13

Age and Sex Structure of the HHs

As indicated in Figure 2A, around 44% of the respondents were female whereas male respondents accounted for 56%. This implies that the surveyed pastoral household in *Shebelley* were male dominated who determine important decisions as pertains the access and utilization of natural resources within the society.

The age structure of the household is an important for pastoralist dealing with extreme climatic extreme events for the minimization of the recurrent drought impacts and utilizing their indigenous adaptive and coping response. As shown in Figure 2B, around 71% of the interviewees age were ranging from 25 to 45 which is the productive and less vulnerable age class, another 17% of the respondents were the age between 46-55, while 56-65 years old respondents were 10% and the rest 2% were older than 65 years.

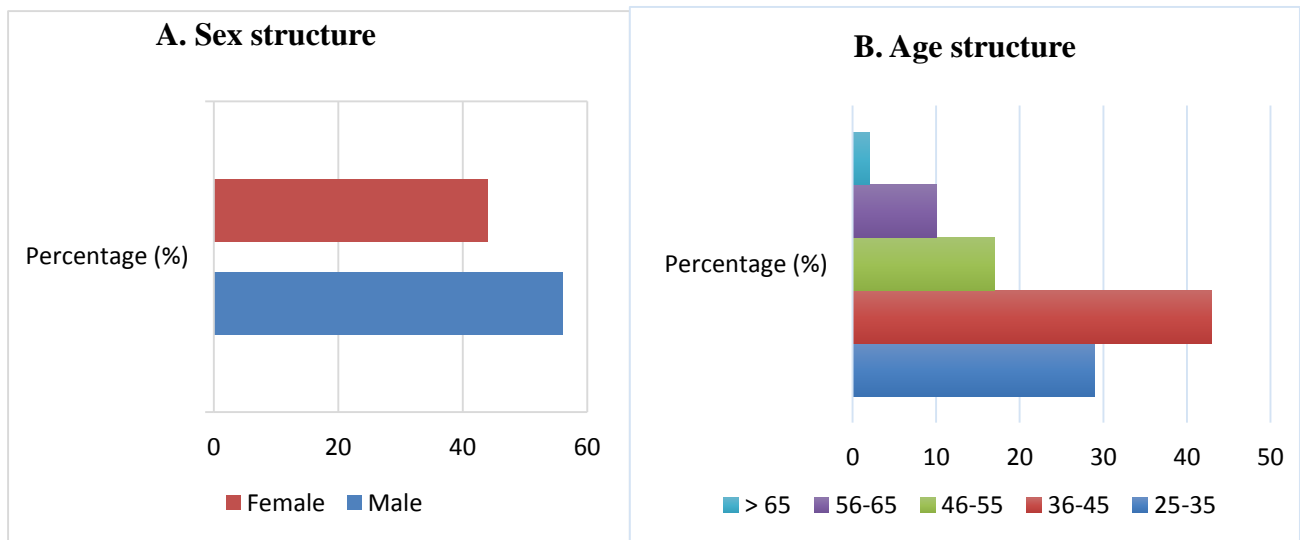


Figure 2: Age and Sex structures of the HHs

Marital Status

As indicated in Table 4, the study has revealed that 85% out of the surveyed 120 households were married, while the widowed females and the men who has divorced their wives and husbands were 4% and 3% respectively where as 8% of the respondents were single (unmarried). In spite of polygamy practice of marriage in *Shebelley* area, means one man may have married more than one wife, most of this households were male dominated, in terms of decisions of family affairs.

Educational Status

This study has revealed that the majority of the sampled *Shebelley* pastoral households were literate pastoralist and the sum of the formal and informally educated respondents were 64% as indicated the above Table 4. Around 36% of the surveyed *Shebelley* pastoral households were illiterate. As shown in Figure 3 below, around 28% of the respondents had reached elementary level, 16% has taken primary education and 6% of the sampled households have reached secondary level where as 1% has completed the diploma level and 13% of the respondents has attended informal *Qur'anic* school.

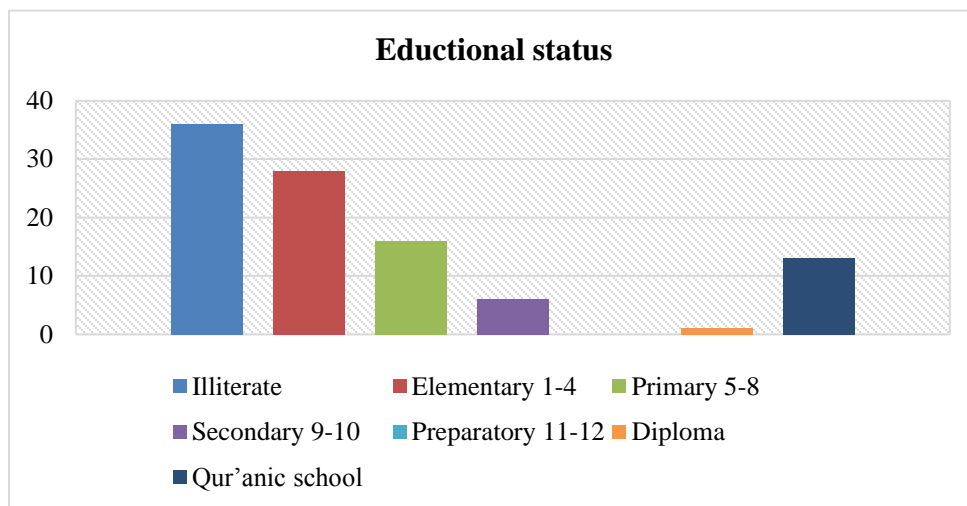


Figure 3: Educational status

Sources of Livelihood of the HHs

The study has identified that pastoralism is the main source of livelihood in the study area, and that 98% of the respondents derive their income from livestock production while a few of the surveyed households which was 2% were agro-pastoralist (Figure 4). Livestock keeping alone for most households in the study area is not enough to secure their livelihood. Other livelihood activities were engaged. Frequent weather variability means that *Shebelley* pastoralists do not have enough food for better part of the year. In order to cope with these situations, households are engaging in wage labour, receiving cash remittances from relatives and government, engaging in sale of charcoal and firewood, and are also venturing in other small businesses enterprises.

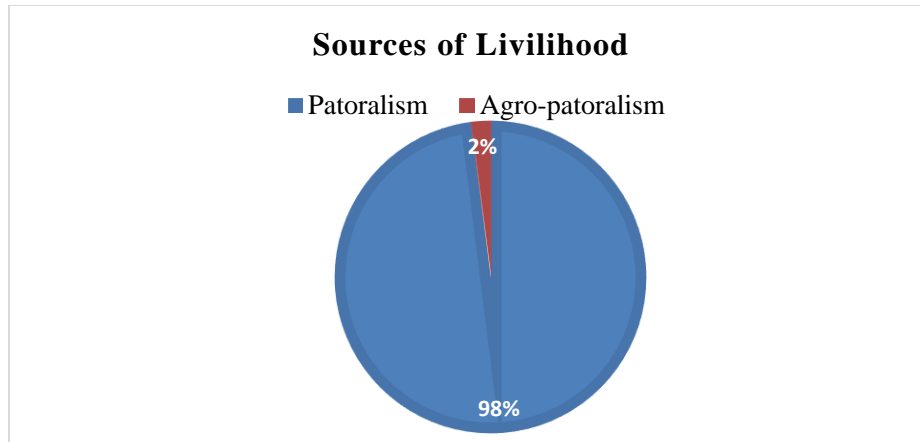


Figure 4: Source of livelihood of the households

Livestock plays a significant role in the pastoral production system in the study area. Most livestock species kept by *Shebelley* pastoral households were goats, sheep, camels, cattle and donkey. The surveyed households were asked to indicate the number of the livestock they have as indicated in Table 5 below.

Table 5: Livestock holdings of the HHs

No. of Species	Sheep %	Cattle %	Camel %	Goat %	Donkey %
0	0	74	0	0	87
1-20	55	26	34	10	12
20-40	32	0	42	12	0
40-60	6	0	22	63	0
60-80	7	0	2	25	0
80-100	0	0	0	0	0

The major source of livelihood for the households was pastoralism with 55% owning between 1 and 20 sheep, 42% were owning 20 to 40 camels and 63% owning 40 and 60 goats; 26 owning 1 to 20 cattle and only a few owning 1-20 donkeys which was 12% (Table 5). The percentage share of goats and camels were larger than any of the other types of holding livestock among the sampled *Shebelley* households and the reason was to minimize livestock loss in times of droughts since goats and camels were increasing in numbers and are known to be more resilient to drought compared to cattle (Dula., 2013).

Another prime reason of keeping camels is for social status as well as milk production because there is more demand of camel milk and meat in nearby urban centres. Donkeys were scarce in number in the study area due to *Somali* tendency of not breeding more donkeys since their holding has no value in terms of social status in *Shebelley*.

Source of water

Bore holes, dig stream beds, springs, and reservoirs (dams, ponds) are the sources of water for livestock and domestic consumption in the study area (SLCRDB, 2014). As indicated by Figure 5, the pastoralists, the major source of water in the study was *Birka* in which more than 88% respondents have mentioned, 49% motorized well/boreholes, 38% rated hand wells, 29% for spring/stream and 14% has mentioned dams.

Most of the motor and traditional hand dug wells, ponds, dams and *Birkas* that take high percentage of the total water coverage are only dependable (to provide water) during and shortly after rainy season, which also usually dry up immediately after the rain. This means only a small share of the population of the zone gets portable water coverage while the remaining struggle for survival for the months outside the two rainy seasons (i.e 6 month of *Jilaal* and *Hagaa*).

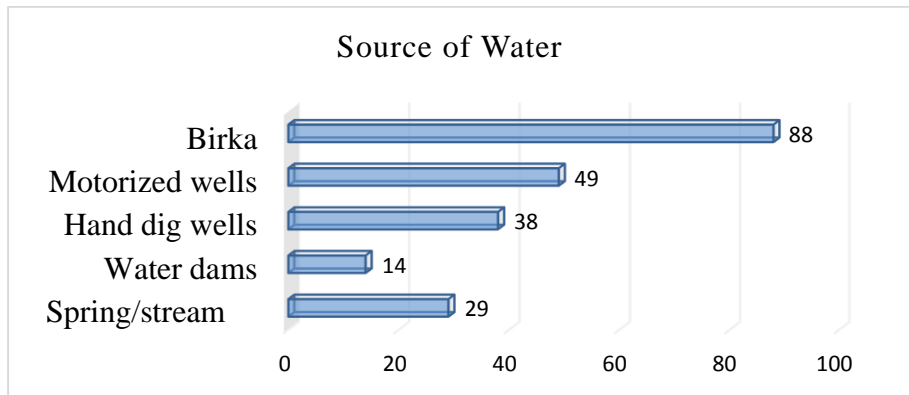


Figure 5: Source of water

Pastoralism Constrains

Pastoral communities in *Shebelley* is facing livestock productions constrains arising from recurrent and prolonging drought in which 85 % of the responded has expressed water shortage and pasture resulting from decreasing rainfall amount in the last three decades and this is in line with the Figure 9 which is showing the existence of huge variability of rainfall in the last 36 years in *Shebelley* district.

Recurrent drought is also imposing a great problem on the lives of the people as well as their livestock's. As indicated in Table 6, around 59% of the respondents were acknowledged about the drought which are becoming more frequent than before. The other important constrains they expressed were including the occurrence of livestock diseases which 55% of the respondents has acknowledged where as 43% has mentioned lack of market for selling their livestock and 42% of the respondents has mention a conflicts over the scarce resources of pasture and water.

Table 6: Pastoralism constrains of *Shebelley*

Constrains of Livestock rearing	Frequency	Percentage(%)
Livestock diseases	66	55
Shortage of water and pasture	102	85
Droughts	71	59
Conflicts	50	42
Lack of market for livestock	51	43

Most of the conflicts over livestock access to water or grazing land are a consequence of resource scarcity (feed and water scarcity) due to the recurrent drought in *Shebelley* area. During the focus group discussions, the study has noted that conflicts over the scarce resource such as pasture and water is not only occurring in droughts periods but also in some places, conflicts occur in wet seasons. For instance, as we have mentioned above, there is a difference of rainy seasons in *Fafan* and other lowland zones in Somali region and when *Shebelley* pastoralists are facing a dry period i.e. if they miss *Dira* rainfall of March, April and May they migrate to the *Deyr* receiving lowland zone of *Fik* and *Degahbour* and these migration causes a resource competition over pasture and water among the arrived and the hosting pastoral communities in these zones.

Key informant interviews has underlined these resource based conflicts particularly, water resource scarcity. One of the key informant interview of livestock bureau head in *Shebelley* district has mentioned the issue of water conflict is becoming a common in recent years due to the water scarcity resulting from the recurrent droughts. A large number of animals migrated from long distance places is meeting one traditional well known as *Ceel* or one motorized borehole and after short period of time the, water becomes scarce due to the capacity of the well and this leads the conflict.

In addition to this, focus group discussions have pointed out the emergence private rangeland enclosures along with the expansion of the agro-pastoralism in some part of *Jarar* and *Fik* zones which is limiting their free movement for searching of pasture and water for their herds. As the result of this, mobility is restricted, which is, of course, the one of the main adaptation of the *Shebelley* pastoralist. This is in line with the report of FOA (2011) which highlighted that lowland pastoralist was facing mobility problems.

Invasive plant species was also another major problem in *Shebelley* area. During the Focus group discussion, majority of the participants have agreed that “*Garanwaa*” plants was one major invasive tree plant which is rapidly spreading and colonizing vast grazing lands in *Shebelley*. *Prosopis Juniflora* is known as *Garanwaa* in Somali is an invasive plant species which is dominating the indigenous vegetation and create more desertification in the study area.

Feed Status of Shebelley Area

Shebelley pastoralists believe that the feed available for different livestock species is decreasing due to the droughts leading to reduction of feed in *Shebelley* area. As indicated in Table 7, 98% of the respondent replied that feed available to the sheep is decreasing, 89% for the feed reduction for cattle, 54 % responded camel feed reduction which less than the previous response for cattle and sheep while 57% of the household responded reduction of feed available to goats. The feed scarcity due to the land degradations and recurrent drought has been reported different Ethiopian lowlands which are the home of pastoral communities including Somali region (Ruijs *et al.*, 2011).

Table 7: Status of feed availability in *Shebelley* area

Species	Feed Availability Trend (% of respondents)		
	<i>Increasing</i>	<i>Decreasing</i>	<i>No Change</i>
Sheep	2	98	0
Cattle	7	89	4
Camel	4	54	16
Goat	10	57	13

4.2. Pastoralists Perceptions on Causes and Frequency of Drought

Almost all of the surveyed pastoral HHs was Muslim followers in religion as we can easily understand their perception toward causes of recurrent droughts. During FGDs, majority of the participants believed that there is human disobedience to their lord (*Allah*) and the consequence of this becomes the punishment of recurrent droughts.

As indicated Figure 6, out of all the interviewed pastoral households, about 56% respondents perceived drought to be a punishment from *Allah* (God) for the human sins, 19% understood it to be decreasing the amount of rainfall, 16% perceived it to be the change of the rainy season while 9% respondents understood that drought is the result of deforestation as indicated in Figure 6 below.

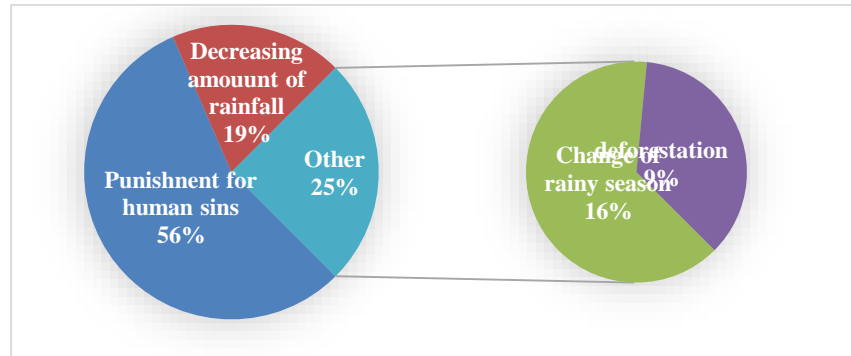


Figure 6: Causes of drought perception

When asked about the pastoralists perception toward drought frequency of occurrence, around 89% perceived that drought frequency has increased for the last 36 years. As indicated in Table 8, 7% of the respondents perceived that drought occurs at every 1 years while 61% respondents were believing that droughts occur every 2-3 years, 24% mentioned that they experience a drought for every 4 and 5 years and 8% of respondents perceive that drought occurs at every 6-7 years.

SPI confirmed (Figure 10) that drought is occurring in every 2 and 3 years in *Shebelley* area and the majority of the surveyed respondents has agreed this but, this finding is contrary to the previous finding which stated that droughts occur in every 3-5 in the arid and semi-arid including Somali region and every 6-8 years for the whole Ethiopia (Haile., 2005). Droughts are becoming more frequent and severe than before in *Shebelley* district for the last three decades. The following Table 8 has summarized the drought frequency perception of the surveyed households in *Shebelley* district.

Table 8: Perceived frequency of drought

<i>Does Drought Frequency Increased?</i>	Percentage (%)
<i>Yes</i>	89
<i>No</i>	11
<i>Indicate the interval of drought</i>	
Every 1 year	7
Every 2 and 3 years	61
4 and 5 years	24
6 and 7 years	8

Drought Indicators

Drought indicators are signs for the coming drought in which the pastoralists have been using for a long period of time but, in recent years, droughts become part of pastoralists live since they become more frequent. Traditional climate prediction methods were also vital part for pastoral production system in *Shebelley* area, specially to cop and adapt the anticipated drought events.

Pastoral community in *Shebelley* have mentioned a number of indicators which they consider as a sign for drought occurrence. As indicated in Figure 7, around 100% responded that dry up of water sources is common phenomena for drought events in this area, since they depend on the *Birka* for their water source, another important indicator which 80% have mentioned was change of vegetation cover in their surrounding environment while more than 60% and 40% percent mentioned reduction of livestock and crop production respectively. The animal production reduction is causing by the feed and water shortages during the dry seasons.

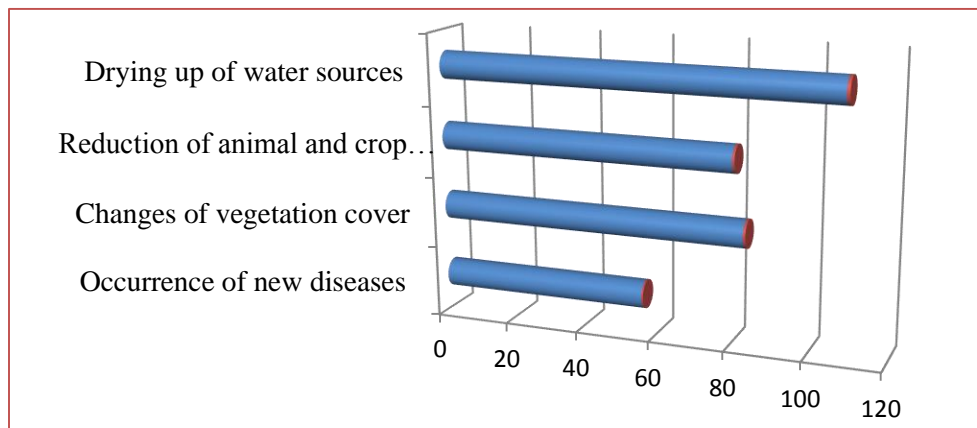


Figure 7: Drought occurrence indicators

Sources of Climate Information

Access to climate information is essential for the pastoral communities across the different regions of the world in which *Shebelley* pastoralist is a part of that communities. In spite of modern climate prediction systems, many pastoralists are still not having an access to these systems and using their indigenous knowledge to adapt and minimize the impacts of climatic extremes such as droughts.

This study has tried to identify the sources of climate information they use, different sources of climate information for these pastoral households were identified for climate in general and particularly drought events. As indicated in Figure 8, it was found that 48% of the respondents were heard from radios, 42%, were getting from traditional sources, 66% word of mouth and 31% getting climate information from the government agencies.

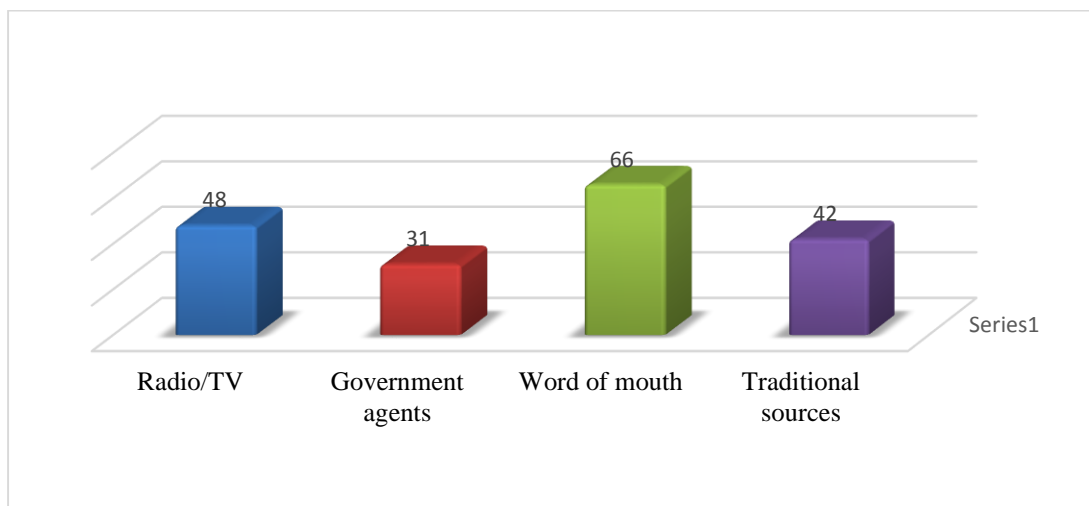


Figure 8: Source of climate Information

Pastoral communities have dealing with their arid and semi-arid environment over a thousands of years and have developed a indigenous knowledge of climate prediction methods. Different indigenous drought prediction methods have been expressed during the focus group discussion which plays a great role the pastoral drought forecasting as well as the type of response to coming even. One worth mentioned example of *Shebelley's* traditional climate prediction is known as “*Xidigis*” in Somali which is the local language, which means astronomy based methods. *Xidigis* was the only traditional knowledge across the Somali pastoralist in Horn of Africa, but now this indigenous knowledge is disappearing due to the modern technological transformation and lack proper documentation.

4.3. Rainfall Trend

It has become conventional wisdom among scientists and ordinary people alike that there is a marked variability in the amount of rainfall over the years. However, empirical figures on the actual change in the amount and distribution behaviour of rainfall is are highly aggregated to national, continental and international level. This study has analysed the trends and variability of rainfall in *Shebelley* district, to examine the characteristics of droughts for the last 36 years. As indicted in Figure 9, rainfall condition shows high spatial and temporal rainfall variability in the study area. The results of the linear trend analysis for the period of the study (1980-2015) has clearly established a general tendency of decreasing in yearly rainfall

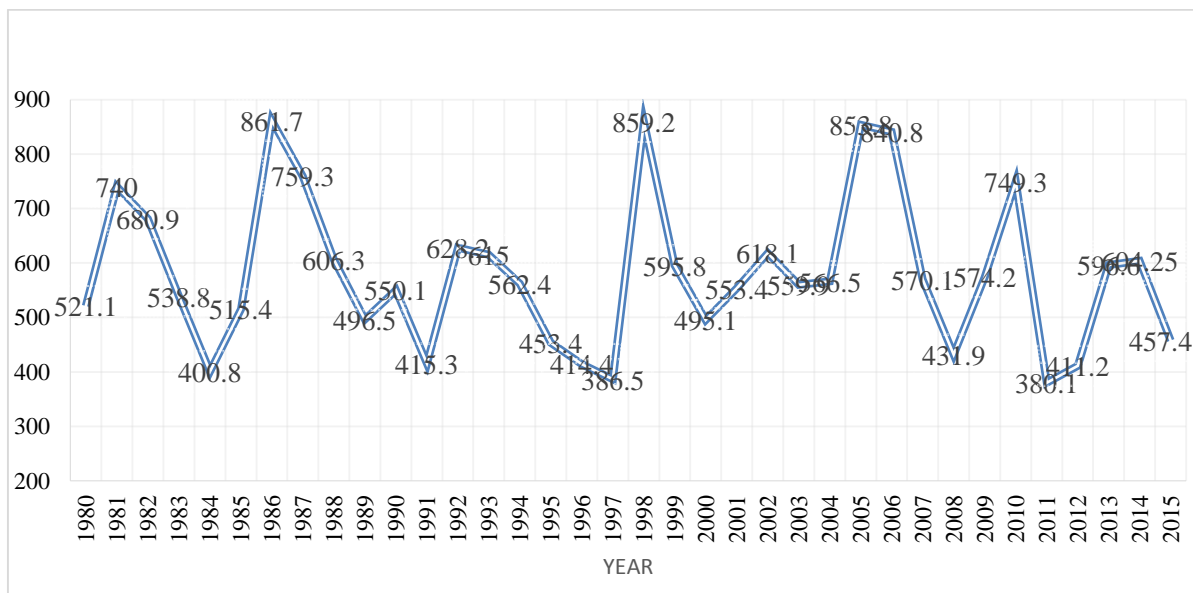


Figure 9: Rainfall trends from 1980 to 2015

As indicated in Figure 9, for the last thirty-six years, the highest total annual rainfall of 861.7mm was recorded in 1986 while second highest rainfall of 859.2 mm was received in 1998 in *Shebelley* district. The year 2011 was recorded the lowest annual precipitation of 380.1mm, which is marked as the worst drought in eastern lowland of Ethiopia, Somalia and some parts of Kenya (SDPPB, 2012). Subsequently, very low annual precipitation was recorded in 1997 and 1984 with 386.5mm and 400.8 mm, respectively. As indicted in Figure 9, about 23 out of the 36 years of the analysed rainfall data was below the mean annual rainfall which is 500-600mm of *Shebelley* district which makes a drought prone area for the last three decades. Similar trend of declining length of rainy seasons has been observed in *Geladi* district (Hadush., 2014).

4.3.1 Drought Characteristics in *Shebelley* District

To identify the frequency and severity of annual drought in *Shebelley* District, the Standardized Precipitation Index (SPI) was used. The SPI analysis was done using 12 month timescales (Figure 10). The results revealed both positive and negative SPI for the last 36 years, depicting from normally *wet* to *moderate* drought. However, the negative SPI results dominated the whole period under study of 1980 to 2015, implying that drought was frequent and severe in *Shebelley* district as indicted in Figure 10 below.

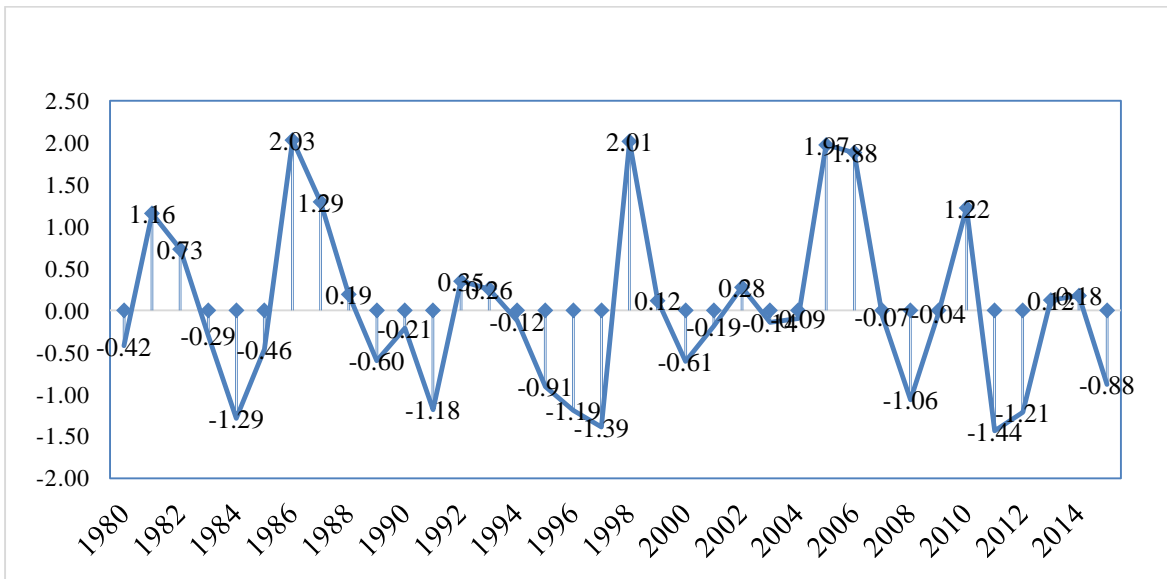


Figure 10: Standardized Precipitation Index :12-month time scale (1980-2015)

The 12-month SPI time scale in Figure 10 has revealed that recurrent drought with different magnitudes has occurred between January and December for the last 36 years. *Shebelley* experiences a lot of meteorological drought. As shown in Figure 10, most years are characterized by recurrent droughts ranging from *mild* to *moderate*. Around 21 out of 36 of the periods under study showed negative SPI values even during the normally short-rainy and main rainy period.

This is highly proved that the drought frequency is increasing, for instance, drought was occurring at every 2 and 3 years for the last three decades. In Somali regional State, drought occur if the main rainy season (locally known as the *Karan* season which fall from July to September fail, and if both the *Karan* rainy season and if the two short rainy seasons (*Karan* in July to September and *Dira'* from March to April) fail and the resulting prolonged dry season can give rise to severe drought conditions (SDPPB, 2012).

4.3.2. Characteristics of Seasonal Droughts

The study has furtherly analysed the drought characteristics of short rainy season (*Dira'*) and the long rainy season (*Karan*) by using 3 months SPI scale. when compared to the 12 months SPI scale in Figure 10, drought is becoming more severe for short and long rainy seasons of the last thirty-six years in *Shebelley* district (Figure 11). This could be attributed to a general fall in the amount of precipitation received in recent years, however, this is 3 month SPI and the results could be associated with the short time scale.

The SPI has identified 19 droughts ranging from *mild* to *extreme* which has occurred during the *Dira'* which is the short rainy season received in the months of March, April and May in *Shebelley* area. As shown in Figure 11a, 2 severe droughts were experienced during the *Dira'* season of 1980 and 1985 while 16 out thirty-six was mild dry were occurred in 1990, 1991, 1993, 1994, 1995, 1996, 1999, 2000, 2001, 2002, 2003, 2008, 2012, 2013, 2014 and 2015 during short-rainy (*Dira'*) season of the last three decades in *Fafan* zone in which *Shebelley* is a part of it. Extreme drought has occurred in 2011 which was the worst drought during short rainy (*Dira'*) season from 1980 to 2015.

As the SPI in Figure 11b shown, three *severe* droughts have occurred during the long- rainy (*Karan*) season which were 1989,1997 and 2012 while two *moderate* droughts have been observed during the *Karan* of 2008 and 2010. Moreover, years like 1983, 1984, 1985, 1991, 1993, 1996, 2000, 2003, 2004, 2007, 2009 and 2015, eleven *mild* droughts were observed. Normal rainfall was received during the long-rainy season (*Karan*) in the years of 1994, 2001, 2005 and 2011.

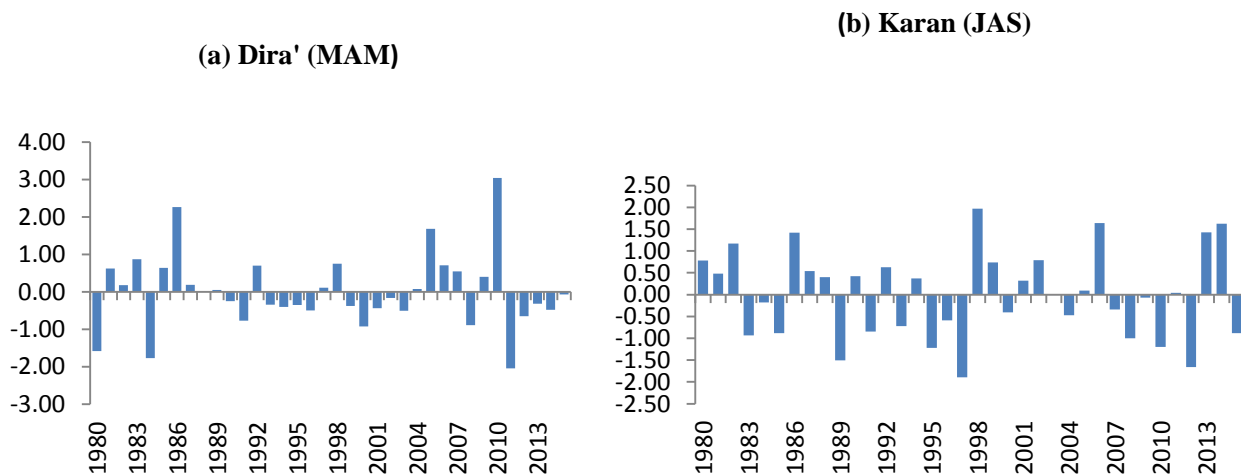


Figure 11: *Dira'* and *Karan* 3 months SPI

4.3.3. Drought Frequency and Severity in *Shebelley* District

Somali region as other parts in the GHA region suffers from the effects of extreme weather events. The impact of droughts on the livelihood of the pastoralist depends on the magnitude and severity of the occurred drought. As indicted in Table 9, drought frequency was drawn up by using the number of drought periods which fell in each category while drought severity was deduced by categorizing the 12-month timescale values for annual rainfall seasons for the whole 36-year period. Out of the analysed 36 year of rainfall, 14 *mild* drought, 7 *moderate* and 15 *normally* wet years have been identified in *Shebelley* area.

The SPI analysis in Figure 10 above revealed that *moderate* and *mild* droughts were observed in 1980 and 2015 in the study area. *Moderate* droughts have occurred in 1984, 1991, 1996, 1997, 2008, 2011 and 2012, while *mild* droughts have occurred in 1980, 1983, 1985, 1989, 1990, 1994, 1995, 2000, 2001, 2003, 2004, 2007, 2009 and 2015.

Table 9: Drought frequency and Severity

SPI Value	Drought Category	Frequency
>+1	Near normal	15
0 to -0.99	Mild	14
-1.0 to -1.49	Moderate	7
-1.5 to -1.99	Severe	0
<-2.00	Extreme	0

In addition to this, when the SPI has furtherly analysed the short rainy *Dira'* and long rainy *Karan* season, it was revealed that 2 *severe* droughts has occurred in 1980 and 1984 and 1 *extreme* drought has been experienced during the *Dira'* of 2011 years while 3 severe droughts have occurred in 1989, 1997, and 2012 during the long- rainy (*Karan*) season as the SPI analysis of Figure 11b indicated.

In contrary to the report of SDPPB (2012) that 2010–2011 drought was the worst drought over the last decades in the region, the 12 months SPI scale in Figure 10 revealed that 2010–2011 was actually a *mild* to *moderate* drought periods in *Shebelley* district, but the further analyse of 3 months SPI scale of *Dira'* short-rainy season of 2011, one *extreme* drought has been identified.

4.3. Drought Impact on Pastoral HHs

The *Shebelley* pastoralist are becoming more vulnerable to drought and the impact been severe and undermining the adaptive capacity of the households. As indicated in Figure 12, one of the major droughts impacts is loss of livestock which is their main source of livelihood as 94% of the respondents rated. Its reported that there is a positive correlation between drought severity and the magnitude of livestock losses (Huho and Mugalavi., 2010). As a result of frequent droughts, a high level of livestock mortality has become a norm in the study area (Respondents cited the 2010 and 2011 drought years as the cause of the highest livestock mortality in *Shebelley* and the rest of the region was also reported huge loss of livestock (SLCRDB, 2014). The other important impact was the poor human health which 73% of the respondents acknowledged, 77% has responded the existence of poor animal health which is resulting from the disease outbreaks due to the drought and feed scarcity (Huho, J.M. *et al.*, 2011).

The *Shebelley* pastoral community is however highly dependent on natural resources, that is, on the availability and accessibility of water and pasture for the animals, 98% respondents pointed out the depletion of pasture and 92% mentioned drying up of water sources. Thus the severity of droughts and their impact on livestock production translate into decline of livestock price in which 81% has responded followed by reduced purchasing power of pastoral households, another 91% of the respondent rated the increased food prices. The following Figure 12 has summarized the impact of droughts on the livelihood of *Shebelley* pastoral households

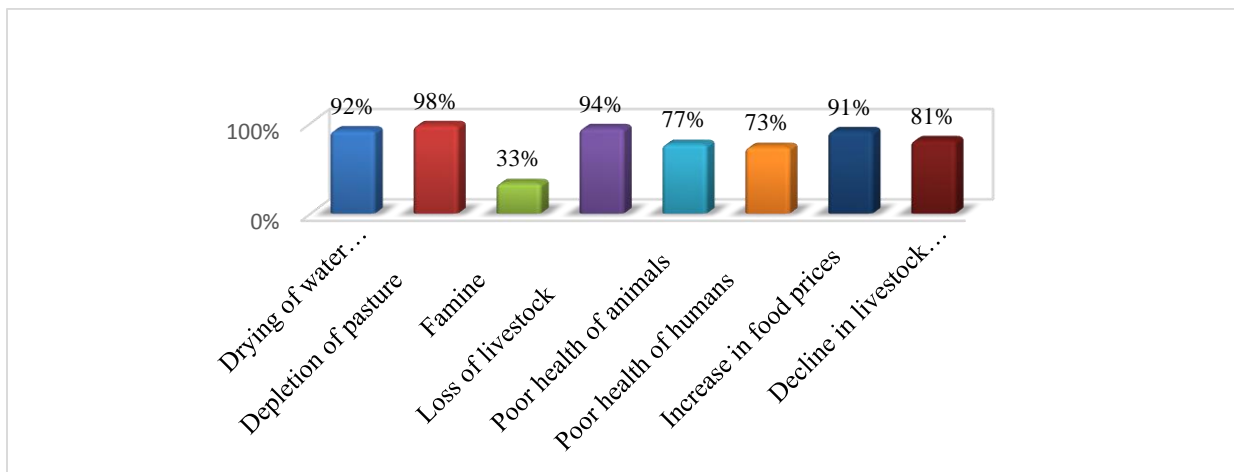


Figure 12: Impact of drought on Pastoral HHs

4.4. Adaptations as a Long-Term Strategy

In the climate change context, adaptation is commonly seen as a set of actions and decision making processes (IPCC, 2012). Adaptive capacity is usually defined as the ability of a community (or social system) to withstand environmental changes. Some authors underlined that a community with generally high adaptive capacity will be less vulnerable in the future than other communities to the potentially detrimental (and often unpredictable) effects of climate change (and other stresses) on their landscape and lives (Petheram *et al.*, 2010).

In spite of the arid and semi-arid of their environment Somali region lowlands, recurrent drought is devastating the livestock assets which is the major *Shebelley* pastoral households. In order to respond to this, they mentioned a number of adaptation strategies to respond to the negative impacts of this frequently occurring droughts. The most commonly used major adaptation strategies among set of options used by pastoralists in the study area include (1) mobility for pasture and water (2) herd diversification, (3) tackling livestock diseases and (4) livelihood diversification and seeking additional sources, (5) shifting to agro-pastoralism (sedentarisation). The details of these key adaptive measures are explained below.

4.4.1. Mobility

Mobility is practiced in *Shebelley* particularly in times of drought and is well known as a primary risk reduction strategy and other processes that encroach slowly on their rangelands. In the arid and semi-arid region, livestock production requires constant or periodic movement in search of pasture; a factor that differentiates this form of livestock production from those practiced by farmers and ranchers (Morton J., 2010). In the case of *Shebelley* area, the household head usually male sends “*Sahan*” to find a better place for pasture and water, after getting the *sahan* information, household heads of male and middle-aged men and young women would move with most of the livestock at the onset of drought to the identified places. These pastoral communities migrate to *Fik* zone, and some parts of *Jarar* zone which are adjacent zones in the area. A small number of livestock especially lactating females “*Irmaan*”, the male camel “*Awr*” and donkey and some young small ruminants is also left behind which is fed with twigs, leaves and pods of trees.

In spite of the challenges facing the free movements of the pastoralists, 100% were replied that they are still practicing mobility during the droughts as an adaptation strategy. As indicated by the below Table 10, some of the reasons of migration were shortage of pastures as 55% rated, where as another 77% of the respondents have mentioned water shortage for human and their livestock due to the drought while 21% were migrating due to the bad weather and 48% mentioned seasonal grazing pattern.

Table 10: Mobility of the HHs

Do you migrate during the drought years?	Percentage (%)
Yes	100
No	0
Reasons for migration	
Shortage of pasture	55
lack of drinking water for animal and people	77
To run from diseases	21
For seasonal grazing	48

In focus group session, it was mentioned that mobility is still practiced although not as much as in the past. However, it was the main strategy in the past years owing to availability of vast lands and various options of permanent grazing reserves and water sources. Another study by Esayas (2007) wrote that the recurring drought and land degradation is restricting the mobility and forced the pastoralist in *Shinile* to practice the seasonal grazing and rangeland enclosure. During the Key Informant interview, it is captured that movement of pastoral households is face a great challenges arising from the pasture and water scarcity caused by the frequently occurring droughts.

4.4.2. Herd Diversification

There is a different drought sensitivity and resistance capacity among the different livestock species. The majority of *Shebelley* pastoral households has agreed that sheep and cattle is less resistance to drought than camel and cattle and that is the reason domesticating more goat and camel as shown Table 5 of livestock holdings. More than 76% pastoralist have been practicing herd diversification as an adaptation and the biggest factor they mentioned is the feed available for the different livestock species is becoming scare due these frequently occurring droughts and the

species tolerance for water shortage. Pastoralists practise multi-species herding, enabling them to utilize different herding environments as of *Shebelley* pastoral community mentioned.

The study tried to identify their species priority for diversification, as indicated Table 11, more than half of the respondents which is 57% were preferring increasing camel which is the more resistant to droughts than the other livestock, while 42% of the respondents were rated the goats and the sheep were least preferred for herd diversification as 21% has rated.

FGDs: Each kind of stock prefers to graze certain plant species and certain types of topography. For example, camels and goats are considered to be, browsers, although they may be grazers at certain times. Cattle and sheep, however, are largely grazers. An area containing both grasses and shrubs may be utilized best with a combination of different ruminant species employing different grazing habits (Dula., 2013). Different ruminant species display differential digestibility of various dietary constituents. For example, goats have better ability for utilizing fodder than do either cattle or sheep (Raphael P. 2016.)

Table 11: Livestock diversification and preference

Do practices any herd diversification?	Percentage (%)
<i>Yes</i>	76
<i>No</i>	24
Livestock Species preference	
Camel	57
Goats	42
Sheep	21
Donkeys	0

During conducting Focus group discussions, majority of the participants have underlined that herd diversification is important adaptation strategy for their mode of pastoralism which reduces livestock loss during the droughts. Key informants have also confirmed that *Shebelley* pastoralists are recently increasing the domestication of drought resistant species due to the depletion graze and water resulting from the frequently occurring drought.

4.4.3. Livestock Selling

Around 97% *Shebelley* pastoral households were practicing to selling their livestock regularly, as indicated the Table 12. When asked about the reasons for selling, 88% were selling for generating the income to purchase food, 63%, were selling for clothes, 39% have mentioned for health care and 44% rated other purposes. Livestock Takeoff by selling occurs at different stages for practicing as a long-term adaptation practices or short-term drought response among pastoralist (Raphael P., 2016). Majority of the respondents specified that selling is not limiting for house hold needs but also to cover expenses of other social and religious duties e.g. supporting when some relative or other community households facing in times of marriage or death.

Table 12: Livestock selling

Do you usually sell your livestock ?	Percentage (%)
<i>Yes</i>	97
<i>No</i>	3
Indicate the reason for selling	
Buying for food	88
For cloths	63
For health care	39
Others	44

Mostly goats and sheep were the highest in number used for sale and to generate income in the district. This gave flexible options for households to rely on small ruminant utilization for livelihood engagements as source of income, and food as well as traditional and religious value. Buying and selling activities were carried out throughout the year. However, mostly lowland Somali pastoralists sold most of their livestock in September because of religious festivals celebrated during September (*Idul Arafa* time), exports of livestock types to Arab countries were high and prices (devereux., 2006).

During the focus group discussion, the study has revealed that some of the pastoralist were no longer willing to pursue their previous mode of pastoralism reducing their livestock by selling to start another activity like farming. Recurrent drought along with other anthropogenic activities such as increasing rangeland enclosures is putting under serious pressure on pastoralist and is unable to adequately support the livelihood of the majority, particularly the

poor and very poor segments of pastoralists (Hodgson., 2015). Over thousands of years, pastoralists have managed their resources and livelihoods in the face of environmental challenges and difficult socioeconomic conditions but recently selling livestock is becoming one option to adapt in the long-term and survive (Redwan., 2014)

4.4.4. Tackling Livestock Diseases

Disease become the major causes of livestock loss across the pastoral communities in *Shebelley*, particularly at the times of drought and other related climatic induced disasters. As surveyed respondents has mentioned, some of the livestock common diseases causing livestock death in *Shebelley* were *Kud (Anthrax)*, *Cambaar (Ring worm)*, and *Gooryaan (Faciolosis)*. In time of drought occurrences, emergence or re-emergence of infectious diseases, especially vector borne diseases which are critically dependent on environmental and climatic conditions may impact livestock health (Thornton and Gerber., 2010). As a result of this, pastoral community in the study area were asked about the type of measures they take to maintain the health of their livestock within frequently occurring droughts. Accordingly, 94% of the respondents were using the traditional herbal treatments, 57% used to purchase drugs from the shops while 38% of the respondents were accessing to veterinary service.

Table 13: Tackling of livestock diseases

Measures to tackle livestock diseases	Percentage (%)
Purchasing drugs from shops	57
Use of traditional herbal treatment	94
Accessing livestock veterinary services	38

4.4.5. Livelihood Diversifications

One seemingly effective and probable strategy for the pastoralists in the long term is further diversification of their livelihood outside the pastoral system as indicated by the below Table 14, 95% of the *Shebelley* pastoralist were diversifying their livelihood source. In response to a rapidly diminishing rangelands resource base and the continued fall in animal productivity, *Shebelley* pastoral households suddenly find themselves in a situation where they have to seek alternative forms of livelihood to sustain their families. Majority of the pastoralist in Horn of Africa has lost their livelihood and engaging alternative sources of income in order to put food on the table and supplement the falling supply of animal products (UN-OCHA, 2011).

When asked the about the types of livelihood diversification they take, 66% of the *Shebelley* pastoralist responded that they engage charcoal and firewood selling, 49% were seeking labour employment while 54% of the sampled respondent rated the involvement of contraband trades is their source of income and 46% of the *Shebelley* pastoralist sending their children to schools. Some pastoral households may send their children to school to make sure that they get food through school nutritional programs. For a long time, education for pastoralists was considered by government as an exit strategy to be encouraged, and not as an end or adaptation in itself (SC-UK, 2010).

Table 14: Livelihood diversification

Do you take any livelihood diversification	Percentage (%)
<i>Yes</i>	95
<i>No</i>	5
What are the diversification activities ?	
Charcoal and firewood selling	66
Seeking labour employment	49
Involving Contraband trade	54
Sending children to schools	46

During the FGDs, this study has noted that the men in the study area were involving production of charcoal as a source of income where as women in *Shebelley* area other than the informal milk business rely heavily on the sale of firewood as an alternative source of income which has a high demand in the nearby urban centres.

4.4.5. Sedentarisation (Agro-Pastoralism)

During focus group discussion, they clearly expressed that their pastoral mode in which they have been practice over a long period of time is no longer suitable to practice under this frequently devastating drought. District agricultural bureau head of *Shebelley* has also underlined that, shifting to agro-pastoral mode is newly emerging strategies to adapt the long-term livelihood maintenance. Majority of the pastoralist were not preferring to change their way of life of live and their attitude toward farming was not so good to start but reason which is forcing to engage crop production is that their livestock production have declined and so their ability to manage a mobile pastoral livelihood is becoming less viable with the declined livestock numbers (Hodgson., 2015). Shifting to agro-pastoralist would likely reduce the vulnerability of their livelihood to some extent.

4.5. Coping as a Short-Term Strategy

Unlike adaptations that involve long-term shifts, coping responses are more reactive and mainly involve temporary adjustment of livelihood activities in response to drought (Moreton J. *et al.*, 2010). The sale of livestock and livestock products falls into both categories as pastoralists not only use this option to cover regular adaptation costs. Coping strategies is classified into proactive which is used when the event of drought occurrence is anticipated and is practiced as a preparatory measure to reduce drought impacts and reactive response which is used during the drought as well as after drought occurrence (Opiyo *et al.*, 2014).

4.5.1. Proactive Coping Strategies

This study has revealed a number of proactive drought copings in which *Shebelley* pastoralists have been using to minimize the impact of these frequently occurring droughts as indicated in Table 15. The proactive drought coping strategies of the sampled households were including the purchasing and storing food grains and cereal, increasing the pack animals, making ghee for dry seasons, community religious gathering to pray “*Allah Bari*” for rainfall.

Table 15: Proactive coping strategies

Proactive Copings activities	Percentage (%)
Increase of pack animals (draught animals e.g. donkeys)	89
Making ghee for the dry season	70
Grain/fodder storage (mainly for wealthier households)	75
Gathering for praying (<i>Allah Bari</i>)	48
Feed collection and conservation	57
Changing breeding time	76

Increasing of pack animals

Among a set of proactive options of coping strategies to droughts used in *Shebelley* area, the prime one was increasing of pack animals which are resistant to drought. 89% of the respondents replied that increasing pack animals was one of their tactics to reduce livestock loss resulting from the recurrent droughts; hence *Camel* and *Goats* were the most dominant livestock in the study area; Besides, this pastoralist keeps diverse livestock species; since, all the livestock species have different capacities to resist and survive during the drought events (Rafael P., 2016).

Grain/fodder storage

As mentioned above, the livelihood of surveyed *Shebelley* pastoralist is totally depends on the livestock rearing which means absence of any agricultural practices due to environmental stress and the variability of the rainfall in which the consequence is recurrent drought events in the area, livestock production is decreasing, for the reason of survival, 75% percent of the surveyed pastoral household were purchasing and storing food for dry seasons as indicated in Table 15, which is dependent on rural market with *Jigjiga*, *Babile*, and other adjacent nearby markets. Pastoralists food consumption has shift from milk and meat consumption to food grains and cereal productions from the country and the imported ones from external food (Mulu., 2010). In spite of regular food purchasing, the study has revealed that the household food buying increases before drought events.

Changing breeding time

Indigenous knowledge of pastoralists has evolved with their harsh climatic condition under which they live with over a long period of time. Changing the indigenous breeding time is a herd reproduction coping strategy before drought based on their climate prediction. As indicated in Table 15, around 76% of *Shebelley* pastoralist changes the breeding time of their livestock, especially small ruminants before predicted drought based on their indigenous climate prediction system “*Xidigis*” and its often done by classifying males called “*Summal*” of small ruminants e.g. sheep and goat and keeping in different place from the rest and this minimizes the chance of delivering a babies during the drought times which is making vulnerable both mother and its child.

Feed Conservation

In pastoral production system, livestock herders also practice some form of feed conservation for dry season feeding as 57% of the respondents in *Shebelley* rated (Table 15). In the highlands agro-ecological regions, it’s a common practice to make hay from fallow land or water logged areas and preserve it for dry season livestock feed when feed is scarce (Alibashi., 2016). Among *Shebelley* pastoralists, the principle herd maintenance of pastoralist is extensive grazing but in time of drought, when the majority of the livestock migrate, some of the herd is left behind such as donkeys and one or two female camels for milking and in time of severe droughts, feed is collected for this left herds. Feed collection and conservation in *Shebelley* area was only limited in times of severe and prolonged droughts which causes water and feed scarcity

4.5.2. Reactive Drought Coping Strategies

For a pastoral household, reactive drought coping strategies is always the most challenging aspect of the entire scenario (Opiyo *et al.*, 2014). This depend on the magnitude and severity of the observed drought, the intensity of the impact pastoralists. Likewise, *Shebelley* pastoral household were practicing some reactive coping strategies to maintain their livelihood during the drought and recover after drought occurrence. The following Table 16 shows some of the strategies employed by the *Shebelley* pastoral communities for coping during drought and post drought period.

Table 16: Reactive coping strategies

Reactive Copings Strategies	Parentage (%)
Old/weak livestock slaughtered for consumption	96
Adjustment of HHs food consumption	77
Relying of food aid	83
Household/herd splitting	83
Reduction of gifts to the poor by richer households	52
Increased wild food consumption	66
Charcoal/firewood selling	54
Social support systems	48
Livestock selling	76
Getting money through remittances	60
Restocking	64

Slaughtering Weak Animals

One of the major impacts of recurrent droughts in *Shebelley* pastoralist was poor livestock health resulting from the feed and water scarcity indicated Figure 12 above. Due to this, some animals become weak and unable to survive during the droughts and the pastoral HHs in *Shebelley* were slaughtering weak animals during droughts in which 96% of the respondents have rated (Table 16). Slaughtering weak or old animal which cannot survive during the drought was one nutritional source of the family and neighbours who cannot avoid to buy food for themselves in the area. In other ways, this practice is playing vital role for minimizing malnutrition facing to the households during the drought. ILRI (2006) has also reported that some of the Ethiopian pastoral communities were also slaughtering weak animals during the drought.

Adjustment of HHs food consumption

In the face of drought and severe dry conditions, *Shebelley* pastoralist have been modifying their food consumptions by changing the types of their diet and feeding frequency in which 77% of the households have responded as shown in Table 16. pastoralist communities of Somali region respond to food shocks through ‘protected consumption’ and ‘modified consumption’. Protecting consumption requires buying or being given food to maintain food intake levels. Modifying consumption includes reducing or diversifying consumption, or ‘reducing consumers’ by migrating or sending some household members elsewhere (Devereux., 2006).

In the past, pastoralist’s main source of was drinking the milk and consume the meat and Ghee from their live stocks but now, with the reduction livestock product due to the drought, the staple foods of the community are boiled sorghum with milk which is locally known as “*Gerew*”, milk and meat. *Pasta*, *Rice* and *Macaroni* were also commonly used foods. In recent years, the pastoralists are forced to slightly change their food habits. The introduction and or increased use of oil and wheat, reduced consumption of milk and meat are some of the recognized diet changes by the pastoral community. Another study conducted in *Godey* and some parts of *Shinile* region has also indicated that the community has similarly induced change in food habit (Mulu., 2010).

Increasing Wild Food Consumption

Generally, *Shebelley* pastoralist’s livelihood depends on natural resource available in their surroundings and whenever the pastoral community face a climatic shock like drought which causes food shortage, they gather wild products i.e. fruits and use them either directly as food or sell them as 66% of respondents rated in Table 16. According to FGD, in the past years, the availability of wild fruits was plenty and their first coping response to food shortage was the consumption of wild fruits but recently decreased due to the deforestation. Another study wrote by Mulu (2010) reported that the first coping option available to the poor and the destitute in the past times was wild fruits in *Shinile* zone pastoralists.

Relying on Food Aid

Recurrent drought has forced a large number of pastoral households to lose their livestock assets and seek relief assistance from the government and NGOs. As indicated in Table 16, around 83% of the surveyed respondents has rated food aid. Receiving food aid is one of the recently adopted coping strategies during the drought to fulfil household food demand in *Shebelley* area.

As a result of recurrent drought, large number of Ethiopian Somali pastoralists are facing food shortage for HH consumption during the drought, and they are depending on food aids (SLCRDB, 2014). One of the DAs in *Garsalley* kebele has mentioned that food aid is becoming one of the recently emerging coping strategies for food shortages in the study area since most of the pastoralist has lost their livestock asset due to the drought. Focus group discussions has also agreed that some of the pastoral households who completely lost their livestock cannot avoid to buy foods and maintain their livelihoods anymore and become dependent on food aids.

Herd Splitting/ Household splitting

As indicated in Table 16, 83% of the respondents agreed that they practice herd/household splitting during the drought periods in the area. The study found that small number of ruminants and large ruminants such as cattle and camels are kept for milking which they call “*Irmaan*” for children and other vulnerable members of the households while the majority of the livestock migrates to a far distant places for pasture and water. In some case, they split the herd to kept in several different areas, which make them less vulnerable for losing their livestock wealth in drought periods.

Splitting household during drought is also another important measure as a short term food shortage coping facing the pastoral households in *Shebelley* inhabitants. During the focus group discussion, majority of the participants have mentioned that the poor pastoral households split their family and most vulnerable individuals of the family is send to the relative who are economically stronger and capable for feeding these individuals during the drought, while some may even send their children to the relative living in urban centres. A similar finding has been reported from pastoral communities in Kenya (Lekapana., 2013).

Selling of livestock

Although *Shebelley* pastoralist regularly sell their livestock to fulfil the family basic needs, during the drought, the number of the livestock selling increases due to the food shortage and other drought. As indicated Table 16, around 76% of the respondents increase their livestock selling in time of droughts to reduce the drought impacts, which was an another factor of lower number of livestock holdings as indicated by Table 5, in addition livestock loss caused by the droughts.

In *Shebelley* area, Selling is also used to avoid livestock loss during droughts by converting into a cash and regaining after the drought induced problems i.e. malnutrition, sickness caused by the drought. Additionally, time of drought, livestock sales are characterized by low prices and poor livestock body condition. Handush (2014) has also identified that *Geladi* woreda pastoralist has recently developing to sell their livestock assets to minimize the impact of the drought and regain their asset after droughts.

Charcoal and firewood selling

In time of droughts, income shortage often faces the pastoral households due to the impact of the drought on their livestock productivity which is their main source of income, in response to this, pastoralist in *Shebelley* is exploiting the scarce resource of trees in the area, in which 54% of the respondents said production and selling of charcoal and firewood during the drought is contributing the income of the households as indicated in Table 16. Charcoal is one of the prime factors which are accelerating mass desertification in *Fafan* zone and other parts of Somali regional and there is strong interrelation between charcoal production and the pastoral poverty (Abdi., 2014).

Social Support

Social supporting during the drought was practicing in *Shebelley* area. As indicted in Table 16, about 48% pastoralists were using social supportive activities in the study area. The *Shebelley* pastoral community has a clan-based mutual support system through which they help each other. Traditionally, there is a mechanism through which they share resources, "*Tolnimo*" (literally translated, *kingship assistance*). Devereux (2010) discussed that community organizations of mutual support are common among pastoral communities of *Somali* region pastoralists, there may be some difference existing across the region.

During the FGDs, it was learnt that elders respond in the community to support social network by borrowing animals and giving milk to the poor called in Somali '*Irman*'. In normal times, the poor do not receive *Irman* (gift of *lactating* animals and milk). However, in times of severe and prolonged droughts, there is a reduction of social supporting among the communities caused by the huge loss of livestock. majority of the respondents has agreed that the gifts from the wealthier households is lower in times of severe droughts as 52% of the has rated (Table 16)

Getting money through remittances

Shebelley pastoralist were getting money through remittances from their relatives living abroad as rated by a 60% of the respondents (Table 16) to assure their livelihood survival as well as their livestock. Similar to previous studies, Somali region's diaspora is another major source of income for the pastoralist and agro-pastoralists specially in times of drought events (Devereux., 2010).

Re-stocking

As indicated in Table 16, around 64% surveyed pastoral households have mention that re-stocking is one of their coping strategies after drought periods. Re-stocking enables the receiving families to domesticate the livestock again and peruse their livelihood. Wealthier members of the clan or family distribute some of their livestock to poor members to provide labour during drought seasons. This study has revealed that the pastoralists in the study area were distributing some of their livestock to the poor relative and neighbour who becomes '*caydh*' means (having no livestock to rear) through re-stocking to support their survival. However, re-stocking is not only limited during and after drought periods.

This study has identified a different types of re-stocking methods during the focus group discussions and one of the most important was re-stocking through marriage. When a member of the family usually male decides to get marry the girl's family receives a number of livestock which is often a camel from the man's family known as '*Yarad*' which depends on the wealth status of marrying man. Clan leaders Sultan and religious leaders were also regaining a livestock from their communities to maintain their social status. Re-stocking can be one most drought recovery strategy as well as a long-term adaptation activity, for instance Alibashi (2016) identified that the *Godey* agro-pastoralist were using re-stocking practice as a drought adaptation response.

5. SUMMARY, CONCLUSION AND RECOMMENDATIONS

5.1. Summary and Conclusion

The main objective of the study was to investigate the drought frequency and severity and assess the pastoralist short coping and long term adaptation strategies in the study area thus, the first specific objective was to characterize drought frequency and severity by using by using 12 month SPI scale (*Standardized precipitation Index*) of 36 years' rainfall data obtained from the National Meteorological Agency. The study has revealed that there was rainfall variation within the period from 1980-2015 in *Shebelley* district as indicated in above. The study has revealed that 23 out of the 36 analyzed rainfall was below the mean annual rainfall of the study area.

As a result of rainfall variation, 12 months SPI time scale has identified that the frequency and severity of drought has been increasing for the last three decades in *Shebelley* area. Most of the years were characterized by a recurrent droughts ranging from *mild* to *moderate* droughts, for instance, 21 years of negative SPI was identified which is highly proving that *Shebelley* pastoralist have been experiencing a drought for every 2 and 3 years. The previous studies have stated that, in arid and semi-arid such as *Somali* region droughts occur in every 3-4 year but this is study has identified that the drought is occurring with less interval than before. Majority of the surveyed pastoral households in *Shebelley* area has agreed that the drought frequency has increased for the last three decades and observing every two and three years in their area and this become in line with SPI result in. More than halve of surveyed pastoral households believed that the recurrent droughts are a punishment from *Allah* (God) for human sins.

Recurrent droughts had consequently affected the livelihood of pastoralist in *Shebelley* district. The impact of recurrent drought among pastoral communities normally manifests itself in the form of livestock losses, which adversely affects the provision of subsistence, income, and other socio-cultural goods and services to a pastoral household. Along the impact of droughts, the studied pastoralists were also facing a mobility constrains as a result of land enclosure and expansion of agricultural land uses which making them more vulnerable since their existence as a pastoral community needs a free movement with their livestock.

In addition to this, shortage of pasture and water, livestock diseases particularly during the droughts and lack of suitable market for selling livestock as well as the spread of *Prosopis Juliflora* which is an invasive plant species was also challenging their pastoralism.

In spite of this recurrent and devastating droughts, *Shebelley* pastoralists have been practicing a number of adaptation and coping strategies to adjust their livelihood under the environmental circumstances they live. Some of the long-term strategies they practiced were including: mobility, herd diversification to reduce the livestock loss during the droughts and regular selling of livestock, another important one was the diversification of their livelihood sources by seeking casual employment, charcoal and firewood selling and engaging in petty trade. However, the sustainability of those strategies especially the charcoal and firewood selling is impacting the environment.

The study has also revealed that the short-term coping strategies taken to respond to drought were mainly reactive and proactive. Proactive copings were including buying and storing food grains before drought, making ghee. The reactive copings were including the slaughtering of weak animals during the drought, livestock selling during the drought, consumption of wild fruits, restocking, social supporting systems which were mainly clan based ones, herd and family splitting, charcoal and firewood selling and changing breeding time of their livestock in line with their indigenous climate prediction called '*Xidigis*' and dependence of food aids from the government and NGOs.

In conclusion, *Shebelley* pastoralists have been experiencing recurrent and severe droughts resulting from rainfall variability for the last 36 years which made them to become more vulnerable to the impact of these climatic shocks particularly recurrent droughts. Although they have been practicing their indigenous knowledge to adapt to these environmental stresses, recurrent and severe droughts have undermined these response strategies and even forced some of the pastoralists to become out of the system of pastoralism. In addition to this, a number of constraints such as rangeland enclosures, expansion of farm lands, livestock diseases and invasive species were also challenging their indigenous adaptation strategies to the environmental stresses.

5.2. Recommendations

Based on the findings of the research, the following recommendations are suggested:

- i. Putting in place policies that support pastoralism. Nomadic people lament that so far all government policies are being support of sedentarisation. This study suggests that there is need to support mobility so as to save the pastoralism mode. Mobile schools and mobile clinics/doctors may be some possible ways to avail these services to the nomads.
- ii. To let the pastoralists actively involved in the implementation of adaptation strategies and mitigation measures that can directly or/and indirectly influence their life and to change their attitude that have now and had before, efforts should be made to create awareness on the relationship of the direct and/or indirect impacts.
- iii. Indigenous populations have over the years developed local ways of forecasting weather. More needs to be done in terms of integrating indigenous knowledge to make the early warnings more appropriate to the users. That way the local pastoralists could identify with, accept and use those forecasts. It is also important that government weather forecasters explore traditional ways by which local populations receive or disseminate climate information and use such avenues to disseminate the climate forecasts and the early warning systems.
- iv. Since economic efficiency is the most basic factor for undertaking development programs; as part of development, to change in to practice the adaptation strategies and mitigation measures the economic base of the pastoralists should be built. In addition, the capacity of the local government officials should be promoted and improved in a way that they can able to mobilize the human and capital resources planned for implementing the adaptation strategies and mitigation measures and programs related to climate change.
- v. Supporting education through expansion of schools and materials is also important for their livelihood diversification and future adaptations instead of short-term emergency measures. Education would help transform the next generation of pastoralists in *Shebelley* area which would easily grasp the issues of climate change.

- vi. Cutting trees for charcoal and firewood selling is causing more desertification in the area and could deteriorates the environmental situation of the area. This study is recommending that there is need to mobilize the communities about the value of forest and how cutting the trees can damage their environment in the future.
- vii. Provision of water in and expansion of water infrastructure will also improve the livelihood of the pastoral households in the area.
- viii. Establishment of livestock market in the area. It came out clearly that there is no good livestock market. As well as livestock health centers.
- ix. Conduct a more extensive study that covers more *Somali* Region pastoralist and other lowland pastoral areas for comparison and generalization.
- x. Deep investigation into the nature and characteristics of drought at the rest of the region and other lowland areas of the country.

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ANNEX A: QUESTIONNAIRE FOR THE HOUSEHOLD SURVEY

Name of kebele _____ Name of data collector _____

SECTION 1: DEMOGRAPHICS OF THE HH

Code	Age	Sex M/F	Status S/M/D/W	Educational Level 0 1 2 3

N.B.

Code (relation to household) 1 = Head 2 = spouse 3 = child 4 = father or mother of the head 5 = other

Status S = single M = Married D = Divorced W = Widowed

0 = cannot read and write 1 = can read and write, but no formal Schooling 2 = primary school 3 = secondary school

SECTION 2: SOCIOECONOMIC CHARACTERISTICS

2.1. What is the major source of livelihood for the household? (only one answer allowed)

- A. Pastoralism B. Agro-pastoralism
- C. Farmer D. Other, Specify_____

2.2. if you engage any alternative livelihood activities, what are these?

2.3. If you rear livestock, indicate the number you have now.

No. of Species	Sheep	Cattle	Camel	Goat	Donkeys
0					
1-20					
20-40					
40-60					
60-80					
80-100					

2.4. What problems do you usually encounter with regard to livestock keeping? Tick where appropriate

- A. Livestock diseases B. Shortage of water and pasture
- C. Lack of market D. droughts
- E. Conflicts F. Any other (specify) _____

2.5. What is the main source of water? Tick where appropriate

- A. River/spring/stream B. Water pans or dams
- C. Wells/Boreholes D. Others (specify)_____

SECTION 3. PERCEPTION OF DROUGHT AND ITS IMPACTS

3.1. What is your perception about the drought? _____

3.2. what causes drought?

- A. Shortage of amount of rainfall

- B. Change of rainy season
- C. Sins of humans D. Deforestation
- E. Others (specify)_____

3.3. Did the frequency of drought has decreased for the last decades in your area?

- A. Yes B. No

If yes, indicate the interval

- A. Every 1-year B. Every 2 and 3-year C. every 4 and 5 D. 6 and 7 years other_____

3.4. What are the effects of drought in your area?

- A. Drying of water sources B. Depletion of pastures
- D. Loss of livestock E. Poor health of humans F. Poor health of animals
- G. Increase in food prices
- H. Decline in livestock prices

3.5. How do you get the information on weather forecasts?

- A. Radio/TV B. Government agents
- C. Word of mouth D. Traditional sources E. Other (specify)_____

3.6. What is the trend of feed availability for different species of animal over years?

- A. Increasing B. Decreasing C. No change

Put tick mark on the appropriate column.

Species	Feed availability			Remark
	Increasing	No change	Decreasing	
Sheep				
Cattle				
Donkey				
Camel				
Goat				

SECTION 4: ADAPTATION AS A LONG TERM STRATEGY

41. Have you been migrated during the last drought period?

- A. Yes B. No

4.2. If yes, where did you go? _____

4.3. Whenever you need to migrate or move your animal in search of feed and water, what is your information source for the location, quantity and quality of feed and water?

4.4. Who decides when and where to go? _____

4.5. Do you migrate/move with your livestock during good years (when there is no Drought)?

- A. Yes B. No

4.6. If yes, why do you migrate/move?

- A. Shortage of pasture B. Lack of water for animals and people
 C. Give time for pasture regeneration D. Escape bad weather

E. Other (specify) _____

4.7. What are the livestock adaptation practices due to frequent droughts?

- A. Herd mobility B. Livestock diversification C. Destocking

4.8. Whenever drought occurs which species of animals are most affected?

4.9. do you practice herd diversification?

- A. Yes B. no

<i>Livestock Species</i>	<i>Rank</i>
<i>Sheep</i>	
<i>Goats</i>	
<i>Camel</i>	
<i>Donkeys</i>	

4.10. why you prefer to increase those types of livestock?

4.11. Which are the most killing livestock diseases in your area? (Use local names)

1. _____
2. _____
3. _____

4.12. What measures have you been taking to tackle livestock disease problem?

- A. Purchasing drugs from shops
- B. Use of traditional herbal treatment
- C. Accessing livestock veterinary services
- D. Other, specify _____

4.13. Do you usually sell your livestock?

If yes, indicate the reason of selling

- A. Buying food B. To buy clothes
 - C. For the health care
 - D. Other. Specify _____
-
-

4.14. To minimize the impacts of frequent droughts, do you take any livelihood diversification?

- A. Yes B. No

4.15. What are the diversification activities?

- A. Seeking labour employment
- B. Charcoal and firewood selling
- C. Sending children to schools
- D. Involving Contraband trade

SECTION 5: COPPING STRATEGIES

5.1. What are the major indicators of drought occurrence?

- A. Drying up of water sources B. reduction of animal and crop production
 C. changes of vegetation cover D. occurrence of new diseases to humans and animals
 E. other _____

5.2. What type of short-term response use practice, please mark the following table?

COPINGS STRATEGIES	The period you practice	
	<i>Proactive</i>	<i>Reactive</i>
Old/weak livestock slaughtered for consumption		
Minimization of food consumption		
Relying of food aid		
Changing breeding time		
Family/herd splitting		
wild product collection and sale		
Reduction of gifts to the poor by richer households		
Increased wild food consumption		
Charcoal/firewood selling		
Social support systems		
Livestock selling		
Gathering for praying (<i>Allah Bari</i>)		
Restocking		
Grain/fodder storage (mainly for wealthier households)		
Making ghee for the dry season		
Increase of pack animals (draught animals e.g. donkeys)		

**ANNEX B: SEMI STRUCTURED INTERVIEW GUIDE QUESTIONNAIRE WITH THE
KEY INFORMANTS**

1. What is the situation of drought in your district?
2. What makes it different what used to?
3. To what is the extent of drought impacts on your livelihood?
4. What are the drought long-term adaptation mechanisms practiced by the pastoralist in the district?
5. What are the short coping responses to drought practiced in the district?
6. What are the roles of your office related to drought short term coping and long-term adaptation strategies mechanisms?
7. what are the pastoralism constraining in your area?

ANNEX C: GUIDELINE FOR FOCUS GROUP SESSIONS

1. What methods do you use to know whether drought is going to occur or not?
2. Do you believe that the frequency of drought occurrence has increasing for the last ten years in your area?
3. What are the differences you observed between the droughts that has occurred for the last thirty years?
4. What short-term coping activities did you take in case of drought occurrence?
5. What are activities you practice to adapt long-term impact of drought?
6. What are the challenges and constrains to coping and adaptation activities?
7. In your opinion, what activities are the best coping and adaptation mechanisms for future?
8. What are the impacts of droughts on your livelihoods?