ADAPTIVE STRATEGIES OF PASTORALISTS TO CLIMATE CHANGE IN AYSAITA AND AFAMBO WOREDAS OF AWSA ZONE, AFAR NATIONAL REGIONAL STATE, ETHIOPIA

A thesis submitted to the Indira Gandhi National Open University (IGNOU)

In Partial Fulfillment of the Requirements for the Degree of Master of Arts in Rural Development

By

AYDAHIS AFKEA MOHAMMED

Enrollment №, 099108636

August, 2011

Addis Ababa

DECLARATION

I hereby declare that the Dissertation entitled: **ADAPTIVE STRATEGIES OF PASTORALISTS TO CLIMATE CHANGE IN AYSAITA AND AFAMBO WOREDA OF AWSA ZONE, AFAR NATIONAL REGIONAL STATE** submitted by me for the partial fulfillment of the M.A. in Rural Development to Indra Gandhi National Open University, (IGNOU) New Delhi is my original work and has not been submitted earlier either to IGNOU or to any other institution for the fulfillment of the requirement for any course of study. I also declare that no chapter of this manuscript in whole or in part is lifted and incorporated in this report from any earlier work done by me or others.

Place: Addis Ababa Signature:

Date: September 27, 2011 Name: Aydahis Afkea Mohammed

Enrolment № 099108636

Address: Samara

CERTIFICATE

This is to certify that Mr. AYDAHIS AFKEA

Student of M.A. (RD) from Indra Gandhi National Open University, New Delhi was working under my supervision and guidance of his / her project work for the course MRDP- 001. His/ her project work entitled

ADAPTIVE STRATEGIES OF PASTORALISTS TO CLIMATE CHANGE IN AYSAITA AND AFAMBO WOREDA OF AWSA ZONE, AFAR NATIONAL REGIONAL STATE which he is submitting is his genuine and original work.

Place: …… Signature: ……..

Date: …….. Name: …….

Address of the Supervisor……

DEDICATION

I dedicate this thesis manuscript to all pastoralists in the world who suffer due to Climate change.

BIOGRAPHY

The author was born in Aysaita on 1973. He attended his elementary and junior secondary school at the then Atse Gebre Meskel Elementary & Junior Secondary School now Mohammed Hanfare Elelta Preparatory School and his High School in Assab and Dubti towns. He joined Jimma College of Agriculture and graduated in Diploma in General Agriculture in 1994. Then, he joined the Alemaya University and graduated in B.SC. Degree in Agricultural Extension in 2000. He has been working in Afar region governmental and non- governmental organizations at various positions.

ACKNOWLEDGEMENT

The author is highly indebted to his advisor Mengistu Huluka (PhD) as without his encouragement understanding and guidance the completion of this work would not have been possible.

Special words of thanks are to all which one or the other way contributed for the success of this work.

TABLE OF CONTENTS

Pages

TABLE OF CONTENTS (CONTINUED)

TABLE OF CONTENTS (CONTINUED)

LIST OF TABLES

Table **Page**

LIST OF FIGURES AND ILLUSTRATIONS

LISTS OF BOXES

ACRONYMS

ARAB	Afar Regional Agriculture Bureau
ARPARDB	Afar Regional Pastoral Agriculture & Rural Development Bureau
AWD	Acute Water borne Diarrhea
BoFED	Bureau of Finance & Economic Development
CM	centimeter
CSA	Central Statistical Agency
FAO	Food & Agriculture Organization
HHs	Households
ICRC	International Committee of Red Cross & Crescent
IGNOU	Indira Gandhi National Open University
IPCC	Intergovernmental Panel on Climate Change
MM	Millimeter
MoFED	Ministry of Finance & Economic Development
NAPA	National Adaptation Program of Action of Ethiopia
NMSA	National Meteorological Service Agency
PCDE	Pastoral Community Development of Ethiopia
PFE	Pastoral Forum Ethiopia
PPM	Parts per million
SPSS	Statistical Package for Social Science Software

UK	United Kingdom
UNEP	United Nation Environment Protection
UNDP	United Nation Development Program
UNDP-EUE	United Nations Development Program Emergencies Unit for Ethiopia
UNFCCC	United Nations Framework Convention on Climate change
UN-OCHA	United Nations office for the Coordination of Humanitarian Affairs
WBISPP	Woody Biomass Inventory Strategic Planning Project

Adaptive Strategies of Pastoralists to Climate Change in Aysaita and Afambo woredas of Awsa Zone, Afar National Regional State

ABSTRACT

Climate change is rapidly emerging as one of the most serious threats that humanity may ever face. Although no country is immune from climate change, poor countries which contributed least to the problem are the most vulnerable and least adaptive to its impacts. In Ethiopia, global climate change poses particular risks to poor farmers and pastoralists who have an immediate daily dependence on climate sensitive livelihoods and natural resources. The limited economic, institutional and logistical capacity to mitigate and adapt to climate change exacerbates the vulnerability of millions of farmers and herders to climate change. The impacts range from recurrent drought and loss of biodiversity, range lands and soil nutrients, to catastrophic floods and declining livestock and food production. Some of the challenges of this environmental change such as local and regional food insecurity and hunger are still high on the agenda of Ethiopia's development goals.

This study was conducted in two woredas of Awsa Zone, Afar National Regional State with main objectives of identifying the adaptive strategies of pastoralists to the climate change.

The nature of the study required qualitative research, and thus the bulk of the data set is also qualitative. Limited quantitative data was also required to generate additional information.

Data was collected from 12 sample kebeles of the two woredas namely: Aysaita and Afambo, using focus group discussion, in-depth individual and group interview, participatory observation survey was also conducted on 40 randomly selected household heads using structured interview schedule.

In response to the climate change the following adaptive strategies were identified: Pasture survey and mobility, fuel wood and charcoal selling, destocking through selling, supplementary feed from seed pods and branches of trees, wage employment and reducing the frequency and size of meal and eating alternative food, modifying herd structure, resource sharing, and income diversification.

Therefore, in the Afar regional state in general and Aysaita and Afambo woredas in particular need to develop integrated / holistic disaster risk reduction and early warning system, focus on raising awareness, knowledge management and information dissemination, target and empower women and other vulnerable groups, promote climate friendly development initiatives, build local capacity to collect, analyze and interpret data and mobilize adequate and stable financial resources.

INTRODUCTION

Pastoralism is a subsistence (economic) pattern in which people make their living by tending herds of large animals. The species of animals vary with the region of the world, but they are all domesticated herbivores that normally live in herds and consume grasses or other abundant plant foods. There are essentially two forms of Pastoralism namely; nomadism and transhumance. Pastoral nomads follow a seasonal migratory pattern that can vary from year to year. The timing and destinations of migrations are determined primarily by the needs of the herd animals for water and fodder. These nomadic societies do not create permanent settlements, but rather they live in tents or other relatively easily constructed dwellings the year round. Pastoralist nomads are usually self sufficient in terms of food and most other necessities, on the other hand transhumance pastoralists follow a cyclical pattern of migrations that usually take them to cool highland valleys in the summer and warmer lowland valleys in the winter.

The Afar pastoralists groups have experienced droughts and other shocks like flood since time immemorial. Recently, the severity of drought has increased its magnitude that it is now becoming difficult for the pastoralists to reconstitute sufficient herd size to help them.

The failure of rainfall or delayed rains, chronic water shortages, livestock diseases and pests, human diseases like malaria and water borne diseases are the key vulnerabilities due to the climate change in Afar region and other pastoral areas of the country. Hence the pastoralist communities have their own traditional adaptive strategies to overcome the above mentioned

challenges. Through time the pastoralists have developed their own coping and adaptive strategies that can greatly contribute to managing the climate change.

Therefore, the main purpose of this study was to focus on the efforts made by the pastoral communities in adaptive strategies to climate change in Aysaita and Afambo districts of Awsa Zone, Afar National Regional State.

OBJECTIVES OF THE PRESENT STUDY

The main objective of the study was to assess local adaptive and coping strategies of Afar pastoralist to climate change.

The specific objectives are as follows:

1. Identifying the adaptive strategies of pastoralist to the climate change.
2. Assess the perception of the pastoralist regarding the viability of their current livelihood system and identify what they perceive as alternative livelihoods;
3. To study the factors influencing climate change

These specific objectives are intended to direct the study in identifying aspects of adaptive and coping strategies of the Afar pastoralists to climate change.

STATEMENT OF THE PROBLEM

For a long time in the past, there was no comprehensive and integrated policy ensuring sustainable livelihood for people in pastoral areas in Ethiopia (Richard, 1997). The main pastoral communities of Ethiopia that constitutes about 12% of the countries population are, the Somali (53%), Afar (29%), Borena (10%) living in the South East, North Eastern and Southern parts of Ethiopia, respectively, and the balance (8%) are found in Southern Gambella and Benishangul Gumuze regions(Ibid,1997). Pastoral studies at country level in general and in Afar region and Awsa zone in particular are scarce.

The pastoral areas of Ethiopia are regarded as drought – vulnerable with chronic food deficiencies. Similar to other pastoral systems in Ethiopia, the Afar pastoral system, traditionally based on livestock husbandry for wealth generation and milk production and which has been regarded as one of best examples of a sustainable range land production system for East Africa has come under increasing pressure as human populations grow and per capita availability of natural resources decline. In particular, recent increases in human and livestock populations, decreases in availability of grazing lands, and a decline in adherence to social mores and weakened traditional safety nets have eroded the effectiveness of traditional means to stem risk of livestock losses during drought which compromised the food security situation of herders, increasing conflict, increasing incidence of livestock and human diseases, market uncertainty, and low economic development aggravated the food security situation of Afar(Getachew,2001).

There are two major livelihoods in Afar region; Pastoralism and agro- Pastoralism. Approximately 90% of the region's rural population practice Pastoralism while the remaining 10% practice agro-Pastoralism which consists of a mixture of livestock rearing and rain-fed or irrigated crop production. Grazing land tends to be communal, although migration may take place beyond a clan's territory. The region has a bimodal rainfall pattern. The seasonality of Afar region is largely determined by the timing, availability and performance of the rains. There are three rainy seasons: the main 'Karma' rain accounts for most annual rainfall and occurs from July to September, there are then rainy showers in mid- December / early January called 'Dadda' and a short rainy season during March and April called 'Sugum'. Disruption in the performance of any rainy season impact the availability of pasture and water as well as the overall food security situation of the pastoral and agro-pastoral communities. There are 'good 'rainfall years and 'bad' rainfall years which are defined not only by variations in overall precipitation but by irregularities such as a late start of the rains which seriously affect pasture and water availability. In essence, if rainfall performance is below normal it results in impacts such as low livestock production, early migration; crop failure, etc (Save the children-UK, 2008).

The Afar pastoralists are transhumant, having home bases and satellite camps to manage their livestock production system in the prevailing climatic conditions. In Afar region, the introduction of large commercial farming blocked access to traditional dry season grazing areas. The people for many years remained in conflict with introduced commercial farming. After the change of government in 1991 about 15,000 hectares of land was returned to Afars (Richard, 1997).

The regional government commissioned a consultant to study and recommend how Afar pastoralists will be able to use the land. The conclusion was to sedentary the Pastoralists. This recommendation however, has not yet been implemented. The Afar has not yet been fully integrated in to irrigated agriculture. In some areas, Afar pastorals give out land to out siders for share cropping, although such practices are not recognized legally(ICRC,2005).

Understanding the particular constraints and adaptive strategies of pastoralists is an important first step for designing and implementing appropriate development interventions as well as emergency actions to support their economies in times of crises.

In the marginal arid lands inhabited by the Afar, sustainable land use is based around an intimate traditional knowledge of the environment and how to utilize it to its maximum potential without destroying it. The traditional strength of the pastoralist way of life in the dry lands has been an ability to make use of that environment to its full potential, where other peoples would fail to survive (Scoones, 1994).

Within the former irrigated state farms along the Awash River and Awsa zone, large tracts of land have in recent years become invaded by the aggressive exotic shrub Prosopis juliflora

(Mesquite bush) this has formed tangled thickets shading out other more useful species, competing against them for nutrients and water. Prosopis pods attract goats but the plant forms thorny thickets which prevent free movement of either human or animals. How best the former grazing land can be used is now a matter of concern (UN-OCHA, 2007).

Bush encroachment and the expansion of invasive plant species in the range lands of Ethiopia are the result of climate change. Generally the pastoralist communities are under pressure due to global warming.

Pastoral Afar communities have adaptive strategies on climate change as follows: Species diversification, spatial segregation of herds, mobility, herd accumulation, herd dispersal over a wide range of grazing lands and social networks.

The Climate is a natural phenomenon which influences positively / negatively social and economic activities. Climate has its own peculiarities and affects future opportunities for and prospects of the country. Even though Ethiopia's green house gas emission rate is minimal, the country is affected by climate change. There are agro- ecological zones (Dry land and semi-dry land areas) and economic sectors which are more vulnerable to climate change. Research findings show that Ethiopia annually losses 2% to 6% of its total production due to the effects of climate change. In Ethiopia climate change causes sporadic distribution of rainfall in dry and rainy seasons. In some cases excessive surface water run- off results has catastrophic effects, for instance, very rapid filling and emptying of ground water reservoirs has been witnessed (MoFED, 2011).

Climate in Ethiopia, where Pastoralism is the major production system, is dominated by arid and semi-arid zones largely defined by rainfall and temperature regimes whose interactions

determine differences in vegetation and primary production that influences human and agro-ecology. The rainfall pattern in these areas is either unimodal as in most parts of Afar or bimodal as in Borena plateau. In general very arid climates tend to occur under unimodal rainfall and warmer temperature, while the semi arid climates occur under bimodal rainfall and cooler temperature (Tafesse, 2001).

No doubt that climate change is affecting dry lands and pastoral livelihoods in Africa in general and Ethiopia in particular as a result, these areas tend to become drier and the existing water shortage will worsen. In addition, Climate change is likely to bring about even more erratic and unpredictable rainfall and more extreme weather conditions such as longer and more frequent droughts. Where this happens, the delicate balance on which pastoral systems depend is undermined. The qualities, quantity spatial distribution of natural pastures are mainly shaped by rainfall (Tesfahun etal, 2003).

Climatic changes such as Global Warming and the occurrence of EI Nino are some of the other major factors that have disrupted the world's ecosystem, but particularly that of the dry lands, through the continuous depletion of the global environment. Realizing the extent of the damages that could happen some parts of the world because of some unwanted controversy exists as to the effects of global warming on the production system. Predictions point to more extremes in weather conditions with heavier rainfall periods, interspersed with drier, hotter conditions. Increased rainfall should promote the growth of pasture species and increase the livestock productivity system's, but may be more destructive with respect to infrastructure and soil erosion. Some reports indicate that there is an increasing frequency and severity of

droughts. On balance, the prognosis is negative for livestock owners in the Greater Horn of Africa (Santra, 2001).

Understanding the particular constraints and adaptive strategies of pastoralists is an important first step for designing and implementing appropriate development interventions as well as emergency actions to support their economies in times of crises.

Drought among others is one major problem that threatens the viability of the system as livelihood. Drought occurrence is observed to increase at increasing rate, resulting in failure to cope up through pastoralists' indigenous mechanisms. On top of this, Pastoral system has been neglected for long time.

Pastoral communities have suffered a serious of livelihood shocks in recent years, some natural like drought, flood and livestock diseases. Drought is only one among a number of risks faced by herders. Most of the Ethiopian rivers cross the pastoral areas, and crops cultivated on the river bank. There has been no comprehensive study with the necessary analytical rigor on the adaptive strategies of the pastoral community in the context of climate change.

Therefore, this study was initiated to fill the existing knowledge gap on the pastoralist's adaptive strategies in the context of climate change in the study area. It attempted to identify and understand the adaptive strategies of Awsa Zone pastoralists.

5. Literature Review

Concepts and Definitions

5.1 Pastoralism

Pastoralism is an economic system in which most households gain more than 50% of total gross household's income (i.e. including the value of products produced and consumed within the household) from livestock related activities, using an improved pasture (Astrid & Ailsa, 1999)

Pastoralism is the system of livelihood which is those in which 50% or more of households' gross revenue comes from livestock or livestock related activities or where more than 15% of households' food energy consumption consists of milk or milk products produced by the household(Daniel,2005).

Pastoralists reside in some of the harshest, most climatically variable landscapes, and many still manage to exercise their traditional way of life despite efforts to settle them and to modernize their livelihood system. Pastoralism provides a major contribution to many economies in arid and semi-arid lands.

Pastoralism is most often an adaptation to semiarid open country in which farming can not be easily sustained with out importing irrigation water from great distances. Moving from place to place in search of pasture and water for their livestock is a life long routine for pastoralists. For majority of these people, boundaries denoting the various countries hold meaningless because where they pitch camp is not dictated by any administrative structure, but by climatic

conditions and availability of water and pasture for their livestock. Pastoralists have not historically been perceived to have a good relation with the environment, accused of over grazing and desertification, more recently they have been seen to be responsible for methane emissions and low feed – conversion rates.

5.2 Pastoralist Areas of Ethiopia

The pastoral territories of Ethiopia are generally classified as ‘’ Qolla ‘’ (Dry lowlands) , which lies below 1500 meter above sea level and having low precipitation of 400-700 mm at annual average. Hence, it can be said that the Ethiopian pastoralists inhabit the geographic, environmental, economic and political peripheries of the country (Deutscher, 2005).

The pastoral areas are estimated at 61% of the total size of the country and the population at 10%. These territories comprise large areas of the country surrounding the agricultural settlements of the plateaus. The area constitute 7 regions, 21 Zones and 123 Districts / woredas. The pastoral areas also encompass 42% of the national livestock population (BoFED, 2008).

5.3 Afar National Regional State

The Afar National Regional State is located in the Northern part of the country. It is geographically located between 39^0 34' and 42^0 28' East longitude and 8^0 49' and 14^0 30' North latitude. The regional boundary is defined by the revised constitution of The Afar National Regional State Proclamation No. 14/ 2002 Article 2. According to this proclamation the region shares boundary with 4 National Regional states i.e. in the North Western Tigray, in the South West Amhara, in the South Oromia and in the South East Somali Region and has two International boundaries in the East Djibouti and North East Eritrea (Ibid, 2009).

At present the region is divided into 5 Zones, 32 Districts / Woredas and 401 Kebeles. The region is situated in the low land, with an irregular drainage system and depression which is 114 meter below sea level. The Afar National regional state has an estimated total population of 1,493,409 out of which 57% are males (statistical abstract projection based on CSA, 2006).

About 91.8 % of the population is rural inhabitants and an estimated area of about 85,410 KM square. The land use pattern is 14.8 % of the total land area is covered by grassland, 31.5% shrub land, 1.7% wood land , and o.11% forest land where as , water bodies and wet lands together account for 1.37 % of the total land, the vast area of the region (49.6%) is an exposed soil, sand or rocks. About 7% of the land in Afar region is also estimated to be cultivable land. The region has many perennial rivers that include Awash, Mille, Kessem, Kabana, Awra, Gulina, Dewe, Telalek, Borkena, Mashiguala and numerous seasonal rivers (Fasil etal,2001).

5.4 Climate Change

Climate is a general pattern of atmospheric or weather conditions, Seasonal variations and weather extremes in a region over a long period at least 30 years; this includes temperature, wind and rainfall. The climate of the earth is not static and has changed many times in response to a variety of natural causes (Ghosh, 2001).

Climate change is one of the biggest risks facing society. In the last twenty or thirty years, climate change and its potential and real impacts have become more and more obvious. Worldwide, between 1980 and 2000, more than 1.2 million people lost their lives due to unseasoned floods, prolonged droughts and storm surges (UNDP, 2004). In addition, climate-sensitive human and animal diseases and crop pests continue to claim more than 1 million lives every year. Without proper consideration of climate change on human development, the world will see increased disasters, migrations, conflicts and ecological destructions most probably in the next few decades. The actual new data about the growing greenhouse gas emissions show that the in 1840 the concentration of CO2 in the atmosphere was 280 parts CO2 in one million parts air – called parts per million, or PPM. Today this important indicator has risen up to 381 PPM– in only about 170 years. The scientists speak of an upper limit, which is 450 PPM by the year 2050, and should not be exceeded.

This near target: 450 PPM by the year 2050 seems just still internationally negotiable by politicians. To speak about any greater increase seems politically incorrect and unimaginable:

650 PPM in 2100 and a global temperature rise by around 4 degree Celsius – as scientists already discuss, nobody wants to speak about in public.

If countries around the world do not reduce emission of green house gases, the manmade cause of climate change, the following would be the probable scenario by the end of 21st century.

- Temperature will have increased by 1- 3.5 c depending on population and economic growth.
- Sea level will be 15-90 cm higher, threatening about 92 million people with floods.
- Rainfall would have decreased and there would be a reduction of food production.

A study report has revealed that African pastoralists to be the first people to be wiped out by climate change.

According to research commissioned by the charity Christian Aid, three million pastoralists of Northern Kenya, whose way of life has sustained them for thousand of years but now facing eradication, hundreds of thousands of these seasonal herders have already been forced to forsake their traditional culture and settle in Kenya's North East province following consecutive droughts that have decimated their livestock in recent years (PCDE, 2001).

Predicted changes in rainfall patterns are bound to result in increasingly scarce, scattered, and unpredictable pastures. The number, distribution, and productivity of permanent pastures and water points which are so critical for livestock survival during the dry season are bounded to

decline. Scarcer resources, coupled with current levels of demographic growth, are likely to lead to stronger competition between pastoral communities and between these and other groups – Possibly resulting in conflict and even violent clashes. As a result, access to pastures becomes more difficult, leading to loss of livestock and of livelihoods (PFE, 2002).

Historically, the global climate is subject to increasing change, and this has become more evident in recent years. In its fourth assessment report, the Intergovernmental Panel on Climate Change (IPCC, 2007) concluded that climate change is already happening with its multifaceted effects on human society and the environment. Since the industrial revolution, the concentration of greenhouse gases in the atmosphere has risen steeply owing to increased anthropogenic or human activities for industrial, transport, construction, agricultural purposes and energy production (IPCC, 2007). The main greenhouse gases include carbon dioxide, ozone, methane and water vapor. Carbon dioxide contributes 9-26%, methane 4-9%, ozone 3-7% and water vapor 36-70% of the greenhouse effect (IPCC, 2001; UNEP and UNFCC, 2002). Other greenhouse gases, though with small contributions, include aerosols produced from microscopic particles and droplets in the air, nitrous oxide, sulfur hexafluoride, and chlorofluorocarbons.

Based on climate models and limited observations, the IPCC confirmed that during the last 50 years the atmospheric concentration of carbon dioxide and ozone has increased each by 35% and the global average temperature has risen by about 0.6ºC, and the concentration of methane has increased by 151% since 1970 (Ennis and Marcus, 1993; IPCC,2001).

Further, climate models project that the mean annual global surface temperature will increase by 1–3.5°C by 2100, global mean sea level will rise by 15–95 cm, and changes in the spatial and temporal patterns of precipitation would occur (IPCC, 1996).

Global climate change affects all countries of the world in many ways. The impacts range from sea-level rise, melting ice caps and glaciers in the polar and coastal regions along with increased incidences of catastrophic drought, flooding and disease burdens in the tropics and sub-tropics (Erickson et. al. 2008; IPCC, 2007). However, the impacts are more pronounced in poor countries with heavy dependence on climate sensitive economies and least adaptive capacity. Studies show that, in these countries, agricultural production, human and animal health, environmental resources, and socio-cultural systems are fundamentally linked to climate (UNEP, 2006).

Associated with changes in rainfall patterns, some diseases such as dysentery, Rift Valley Fever, malaria and cholera become widespread. It is widely recognized that unusual and widespread flooding hazard is a critical factor in initiating cholera, Rift Valley Fever and malaria epidemics in Eastern Africa and the Horn countries (Zhou etal. 2004; Patz etal., 2005). Through increased frequency and intensity of flooding hazards, water-borne diseases such as cholera could become more prevalent. Flooding could also cause the pollution of streams, wells and other traditional water sources in rural areas of Africa thereby introducing parasites such as jiardia, amoeba and cryptosporidium into these sources (IPPC, 2001).

Climate change causes degradation and loss of important natural resources and ecosystems. The most important of these resources sensitive to climate change include rangelands, water, forest ecosystems, and wetlands. Climate change affects biodiversity by influencing species distribution, composition and function directly and indirectly. Recent estimates show that by 2080, the proportion of dry lands in Africa will increase by 5-8% endangering between 25 and 40% of mammalian species in the national parks (Boko et. al. 2007).

The most significant and immediate consequences of climate change on water resources is related to changes in rainfall regimes, soil moisture budges and short-term variations in spatial and temporal distribution of rainfall. Estimates are that climate change could exacerbate periodic and chronic shortfalls of water, particularly in arid and semi-arid areas in the developing world (IPCC, 2001). According to projections, the population at risk of increased water stress in the continent will be between 75-250 million and 350-600 million people by the 2020s and 2050s, respectively (IPCC, 2007).

Ethiopia is especially vulnerable to climate change because of its greater reliance on climate sensitive economic sectors like subsistence crop cultivation and livestock production. In addition, a large part of the country is arid and semiarid and is highly prone to desertification and drought (NMSA 2001). IPCC's regional review of the impacts of climate change identified three vulnerable areas in Ethiopia; food security, water resources and health (IPCC 2001).

IPCC (2007) noted that climate change is causing major social and economic development setbacks in Ethiopia and urged the need to pay attention to the problem. In this regard, Ethiopia has recognized climate change as a threat to its national development aspirations and thus ratified the United Nations Framework Convention on Climate Change (UNFCCC) in May 1994, and the Kyoto Protocol (in February 2005). Within these frameworks, Ethiopia prepared National Adaptation Programs of Action and identified priority areas for development interventions and adaptations. The country has also a number of environmentally oriented policies, strategies and action plans that can directly or indirectly contribute to the objectives enshrined in the UNFCCC. Despite such developments, most development policy and strategy documents hardly captured the threat of climate change.

5.5 Global climate change: Causes and impacts

Climate change is one of the biggest risks facing society. In the last twenty or thirty years, climate change and its potential and real impacts have become more and more obvious. Worldwide, between 1980 and 2000 more than 1.2 million people lost their lives due to unseasoned floods, prolonged droughts and storm surges (UNDP, 2004).

In addition, climate-sensitive human and animal diseases and crop pests continue to claim more than 1 million lives every year. Without proper consideration of climate change on human development, the world will see increased disasters, migrations, conflicts and ecological destructions most probably in the next few decades. The actual new data about the growing greenhouse gas emissions show that the in 1840 the concentration of CO2 in the atmosphere was 280 parts CO2 in one million parts air – called parts per million, or ppm. Today this important indicator has risen up to 381 ppm– in only about 170 years. The scientists speak of an upper limit, which is 450 ppm by the year 2050, and should not be exceeded. This near target: 450 ppm by the year 2050 seems just still internationally negotiable by politicians. To speak about any greater increase seems politically incorrect and unimaginable: 650 ppm in 2100 and a global temperature rise by around 4 degree Celsius – as scientists already discuss, nobody wants to speak about in public.

Historically, the global climate is subject to increasing change, and this has become more evident in recent years. In its fourth assessment report, the Intergovernmental Panel on Climate Change (IPCC 2007) concluded that climate change is already happening with its multifaceted effects on human society and the environment.

Since the industrial revolution, the concentration of greenhouse gases in the atmosphere has risen steeply owing to increased anthropogenic or human activities for industrial, transport, construction, agricultural purposes and energy production (IPCC 2007). The main greenhouse gases include carbon dioxide, ozone, methane and water vapor. Carbon dioxide contributes 9-26%, methane 4-9%, ozone 3-7% and water vapor 36-70% of the greenhouse effect (IPCC 2001; UNEP and UNFCC 2002). Other greenhouse gases, though with small contributions, include aerosols produced from microscopic particles and droplets in the air, nitrous oxide, sulfur hexafluoride, and chlorofluorocarbons.

Based on climate models and limited observations, the IPPC confirmed that during the last 50 years the atmospheric concentration of carbon dioxide and ozone has increased each by 35% and the global average temperature has risen by about 0.6ºC, and the concentration of methane has increased by 151% since 1970 (Ennis and Marcus 1993; IPCC 2001). Further, climate models project that the mean annual global surface temperature will increase by 1–3.5°C by 2100, global mean sea level will rise by 15–95 cm, and changes in the spatial and temporal patterns of precipitation would occur (IPCC 1996).

Global climate change affects all countries of the world in many ways. The impacts range from sea-level rise, melting ice caps and glaciers in the polar and coastal regions along with increased incidences of catastrophic drought, flooding and disease burdens in the tropics and sub-tropics (Eriksen et. al. 2008; IPCC 2007). However, the impacts are more pronounced in poor countries with heavy dependence on climate sensitive economies and least adaptive capacity. Studies show that, in these countries, agricultural production, human and animal health, environmental resources, and socio-cultural systems are fundamentally linked to climate (UNEP 2006).

Agriculture is the basis for the livelihood of millions of people in the developing world. However, changes in the normal pattern of climate affects agricultural production (crops and livestock) by reducing the length of growing periods and forcing marginal areas out of production. According to reports of the IPCC (2007), the projected yield reduction due to climate change in some poor countries could be as much as 50% by 2020. This is a pending challenge that would aggravate the poverty situation in many of the food insecure and ecologically and geographically vulnerable countries… For instance, a third of Africa's population lives in drought-prone areas and is vulnerable to the impacts of climate change (World Water Forum 2000).

Droughts have had severe impacts in Africa, mainly in the Sahel, the Horn of Africa and Southern Africa since the 1960s and 1980s thus increasing the dependency on food imports and food aids. Rising temperature and recurrent droughts have caused changes in the incidence, reproduction, migration patterns, and survival rates of insects and pathogens. This affects agricultural production as damage from disease causing insects and pathogens will be more serious and damaging as the stress from heat and water shortage will weaken the resistance of host plants and crops (IPCC 2001).

According to estimates made by UNEP (2006), yields of some important cereal crops in Ethiopia, Eritrea, Sudan, Zambia, Gambia and Ghana will decline by up to 5% by the 2080s due to climate change. Another estimate by URT (2003) also showed that there would be a significant decline in the production of certain agricultural food crops in Africa (millet yields by 20-76% and sorghum by 13-82% in Sudan, maize yields by 33% in Tanzania). NMSA (2001) predicted a reduction of wheat yield by 10.6% to 18.5% in central Ethiopia. Other studies also demonstrated that the decline in agricultural yield would cause rising grain prices that will expose many people in sub-Saharan Africa to hunger and malnourishment (NASA 2001).

According to WHO (2003) and IPCC (2001), climate change affects animal and human health due to weather extremes (exposure to heat waves and cold), increase in extreme weather events (vigorous hydrological cycles such as floods and storm surges, cyclones, droughts) and increased production of aeroallergens (spores and moulds) and certain air pollutants. Climate change also affects heath by speeding up the transmission of many infectious diseases (especially water, food and vector-borne diseases) and reducing the productivity and availability of food and feed resources. It is believed that climate change alters the ecology of some disease vectors and their spatial and temporal transmission. Common human diseases linked to climate change include malaria, dengue fever, meningitis and cholera, among others (IPPC 2001; Zhou et. al. 2004). Exposure to Ozone may cause damages to lung tissues and affect the health of people through chest pains, nausea, and pulmonary congestion (WHO 2003; IPCC 2001).

5.6 Global responses to climate change

Several international meetings have been held and conventions adopted during decades to address the issue of climate change and its impacts. The United Nations Framework Convention on Climate Change (UNFCCC)[1] is one of the key conventions aimed at preventing dangerous interference with the climate system and hence the stabilization of

[1] UNFCCC is adopted in May 1992 in New York and signed by over 150 countries at the Rio Earth Summit in 1992. It was finally ratified on March 21, 1994 and has achieved nearly universal ratification by more than 190 countries. In 1995 negotiations had started on a protocol – an international implementing agreement linked to the existing treaty, but standing on its own. This led to the Kyoto Protocol, adopted unanimously in 1997 with the main objective of providing mandatory targets on greenhouse-gas emissions.

Greenhouse gas emissions at acceptable levels within a specified timeframe. As a framework treaty, the convention set no mandatory limits on greenhouse gas emissions for individual nations and contained no enforcement provisions; it is therefore considered legally non-binding. Rather, the treaty included provisions for updates (called "protocols") that would set mandatory emission limits. The principal update is the Kyoto Protocol, which has become much better known than the UNFCCC itself. The Kyoto Protocol is adopted in 1997 and ratified by 182 countries with the main objective of providing mandatory targets on greenhouse-gas emissions. The Kyoto Protocol, which entered into force in February 2006, commits industrialized countries (Annex I Parties) to reduce their overall emissions of six greenhouse gases by at least 5.2% from 1990 levels between 2008-2012 (the first commitment period), with specific targets varying from country to country. The targets range from an obligatory reductions of emissions from the EU by 8% to permission to increase emissions by 10% to Iceland. No obligatory targets were set for developing countries, including Brazil, China, and India beyond monitoring and reporting emissions.

In general, global responses to climate change are grouped into mitigation (addressing causes) and adaptation (addressing effects), with the former receiving most of the attention until recently (Nelson etal. 2008). Although climate change negotiations are still dominated by concerns about reducing emissions amongst industrialized nations (mitigation), there are few attempts to operationalizse climate change into the wider development agenda (Huq et al. 2006). As the magnitude of the problem and its impacts on vulnerable communities become intense, issues of climate change adaptation and adaptive capacity are emerging as major concerns in development debates, policy decisions, and political circles. However, adaptation

alone without meaningful mitigation could not help to adequately solve the problem, as there are limits to it. In recognition of this fact, the interaction between adaptation and mitigation that has been overlooked is currently receiving greater attention because of the potential synergies and trade-offs (IPCC 2007).

5.7 Climate change impacts and responses in Ethiopia

Ethiopia is especially vulnerable to climate change because of its greater reliance on climate sensitive economic sectors like subsistence crop cultivation and livestock production. In addition, a large part of the country is arid and semiarid and is highly prone to desertification and drought (NMSA 2001). IPCC's regional review of the impacts of climate change identified three vulnerable areas in Ethiopia; food security, water resources and health (IPCC 2001). Droughts, famines, epidemics and floods are also very common occurrences in Ethiopia. In most instances, these disasters are associated with climatic variability and change. Several studies (e.g. Beruk 2002; Coppock 1994; Dagnew 1995; Dessalegn 1991; Mesfin 1984; Mahmoud 2003; Webb and Braun 1994; Carter etal. 2004; Nicholls 1993) pointed out increased frequency of incidence of these disasters in many places of the country. The disasters have claimed the lives of millions of people, destroyed crops, and contributed to the death of many livestock over the past decades.

Drought is widely recognized as a major climatic hazard and a key development challenge in Ethiopia. While opinions vary on the severity and frequency of drought in the historical past, recent reports show that droughts have increased in frequency and intensity in recent times. In particular, the southern lowlands are extremely vulnerable to drought and there have been

notable droughts in this part of the country over the past years (Getachew 2001; Tesfaye 1988; Pankhurst 1966; Taffese 2001; Webb & Braun 1994). Flooding is also a problem in many places of the country. Major flood hazards have occurred in 1988, 1993, 1994, 1995, 1996 and 2006 leading to considerable loss of life and property (NMSA 2006). For example, the 2006 catastrophic flood led to the death of more than 650 people and the displacement of more than 35,000 people in Dire Dawa, South Omo and West Shewa and caused huge destruction of infrastructure (NMSA 2006). Similar situations were experienced in Afar, Western Tigray, Gambella and the low-lying areas of Lake Tana. Associated with the floods, Acute Water Borne Diarrhea (AWD) and malaria outbreaks have caused many more deaths.

On the other hand, changes in temperature and rainfall have had many negative impacts on human and animal health. For example, serious disease outbreaks including cholera, AWD, meningitis, and malaria have been reported due to altered temperature patterns and rainfall regimes (NMSA 2006; Tulu 1996; McMichael etal. 2004). Changes in disease vector habitats will expose new populations to diseases such as malaria and livestock to schistosomiosis, trypanosomiasis, yellow fever and tick-borne hemorrhagic fevers. NMSA (2001) noted that the growth of the country's economy is highly influenced by climate change, particularly drought, and indicated the need to take these changes into account in development policies and programs.

IPCC (2007) noted that climate change is causing major social and economic development setbacks in Ethiopia and urged the need to pay attention to the problem. In this regard, Ethiopia has recognized climate change as a threat to its national development aspirations and thus ratified the UNFCCC (in May 1994), and the Kyoto Protocol (in February 2005). Within

these frameworks, Ethiopia prepared National Adaptation Programs of Action and identified priority areas for development interventions and adaptations.

The country has also a number of environmentally oriented policies, strategies and action plans that can directly or indirectly contribute to the objectives enshrined in the UNFCCC. Despite such developments, most development policy and strategy documents hardly captured the threat of climate change.

5.8 Drought

Drought is a period of insufficient rainfall resulting in serious damage to crops and other vegetation. It can neither be accurately defined in terms of millimeter (mm) of rainfall nor by the number of days without rain (Roger, 2001).

Drought according to the world Meteorological Organization is a prolonged absence or poor distribution of precipitation and, a period of abnormally dry weather sufficiently prolonged for the lack of precipitation to cause a seriously hydrological imbalance (ARAB, 2000).

Accordingly, three different types of drought have been identified. These are:

Agricultural drought: When rainfall happens to be below the normal to sustain the required soil moisture for crop growth and development of different growth stages of crops, hence causing total loss of crop or yield reduction.

Hydrological drought: When a prolonged absence of rainfall causes the lowering of ground water table reduction or total drying of stream flow, depletion of soil moisture and disruption of water supply system

Meteorological drought: When rainfall happens to be below normal for a specified period over a specific region.

Drought has become one of the major problems of the pastoral production system. At present more than 50% of the chronic drought affected population in the country is from the pastoral areas. The frequency of drought recurrence is greater than before, manifesting itself once every two or three and at times, once every year (WBISPP, 2003).

5.9 Pastoral Coping and Adaptive Strategies

Coping mechanisms are responses of an individual group or society to challenging situations. The coping mechanisms lie within the framework of the individual's , group's or society's risk aversion or tolerance level, i.e. are instituted to minimize risk or to manage loss, While some coping mechanisms may be brought in to play by stress factors, others may be an intensification of an already inbuilt strategy(ARPARDB,2010).

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.

Adaptive strategies are distinct from coping strategies in that they represent a permanent mix of productive activities and require the modification of community rules and institutions to meet livelihood needs. They are most observable in vulnerable socio economic systems and modes of production. To respond to the harsh climatic realities of the lowlands, pastoralists have evolved a variety of coping strategies.

These have been generally successful, but within the last twenty years, drought, which had historically occurred every ten years and have occurred every three, two years placing untenable demands on traditional ways of avoiding disaster (Save the children-UK, 2006).

6. Research Methodology

6.1 Sampling

In Awsa pastoral area, like other pastoral areas of the world, it is difficult to clearly demarcate boundaries by woreda and administrative kebeles. It is also difficult to categorize the pastoralist to specific countries as they move cross boarder in search of feed and water for their livestock. However, as there was no better alternative; kebeles have been used as sample frames for both qualitative and quantitative research approaches. For both qualitative and quantitative data collection 12 representative kebeles were selected from the two woredas. In each sample kebele data were collected from kebele centers as well as randomly selected villages. This had helped to reduce the bias that could have occurred due to urban dwellers misleading responses in expectation of certain material benefits.

The researcher, the interpreters' and also enumerators' good knowledge of the area and the community has helped very much in easily identifying and creating rapport with key informants, community leaders, and elders.

Using qualitative approaches data were collected from the two woredas selected sample kebeles and villages. At least two Focus group discussions, one group interview and three in-depth individual interviews were made in each specific village with elders, community leaders, and interested and purposely selected key informants. Grazing areas, watering points, markets and migration routes have been also used as sample unit to collect qualitative information.

The supportive quantitative data was collected from 40 randomly selected household heads in the two woredas i.e. Aysaita 20 & Afambo 20. In the course of collecting quantitative information, effort has been made to conduct wealth ranking at each sample village so as to take sample households from poor and non-poor respondents. However, the wealth ranking exercise was not reliable as most of the key informants were very much biased to put almost the whole community under poor category. Therefore, since the structured interview schedule was prepared in a manner to collect household assets as accurate as possible, the wealth ranking exercise to categorize the randomly selected respondents was ignored. Instead the key informants were asked to indicate the type and number of animals used to classify pastoralists as poor middle and better-off across time i.e. during data collection period, and ten years ago. Finally the findings of six FGDs with the key informants have been summarized and two

common of wealth categorization tools (one for current and one for ten years ago) formed. Accordingly, the sample proportion has been 52.4 percent (n=54) from poor and 47.6 percent (n=49) from non-poor respondents.

6.2 Data, Data Source and Data Collection Methods

6.2.1 Data and data source

The nature of the study required qualitative research approach, and thus the bulk of the data set is also qualitative. Limited quantitative data was also required to generate additional information.

The main source of facts and ideas of the study was the primary information that was generated through field research in the community.

The other constraint was that such data collections have been conducted frequently during the onset of disasters and also under normal conditions by different organizations and individuals for different purposes, but with little or no response. Majority of the contacted individuals and officials expect some thing from such type of study and accordingly tend to emphasis to worst scenarios and refrain from telling actual information. One practical example is that, in most cases when wealth ranking was made with key informants almost all community members have been put under poor.

Therefore to tackle such problems one major strategy used was to tell the community leaders, key informants and individual respondents clearly and repeatedly that this study will not bring any thing soon rather the major objective is to know and let government and NGOs know how drought is affecting the community during the last three decades. Hence, as telling frankly that no immediate output is expected from the study was some what unusual; it has helped in reducing bias by the respondents to be genuine. Another important constraint was the nature of the study requires full time and attention of the respondents to recall and give ample information. Therefore to overcome this problem, discussions were made at convenient times such as late in the afternoon and evening depending upon situations and locations.

Data was collected both at household and community level mainly using qualitative method with data sources including, participatory observation, Focus group discussion, group interview, individual household interview and case studies/life stories of selected families. To gather quantitative data, structured interview schedule with household heads was conducted.

6.2.1.1 Participant Observation

The initial idea of this study had come to the mind of the researcher just two year before while he visited the woredas and the situation had helped the researcher to visualize the real context and ask major question “how do people cope up and adopt such crisis”. Then during the formal data collection period the researcher have strengthened the already existing knowledge with more objective oriented observation on the overall living condition of the community, pasture and water conditions, emergence and constraints of agro-Pastoralism, settlements and other facts that revolve around drought and adaptive strategies of the community.

6.2.1.2 Focus Group Discussion

The major body of information for this study was collected through in-depth discussion using checklist. Such discussions were made with community leaders, religious leaders, elders, kebele officials, destitute, and pastoralists. Information collected through this source include, Climate change , historical trends of drought, trends in coping strategies & adapting strategies, major constraints affecting the pastoral productions system, community perception on their livelihoods, assumed alternative strategies, perception on the emergency and development interventions.

6.2.1.3 Individual and Group Interview

One major constraint that hampered the research that deals with the adaptation process over the past three decades has been lack of time series data on the livelihood profile of the community. Therefore the only option has been to rely on the memory of the respondents. Using a checklist individuals have been interviewed on their life long experiences in coping and adapting recurrent droughts, their perception towards the viability of their livelihoods, alterative options, and also their view on the ongoing emergency and development interventions in alleviating their problems. However, during the field work it has been understood that individuals recall events more when they are with other colleagues and also the tendency of reducing number of livestock is less when asked together with other colleagues than alone. Therefore both individual and group in-depth interview were used to generate qualitative data such as:

- Factors affecting the system positively and negatively, problems facing
- Changes occurring across time on the components of the system (pasture, water)
- Trends of population engaged in pastoralism
- Trends of livestock population (number and species composition)
- Efficacy of the system in maintaining livelihood
- Other possible source of income other than livestock, in case of extreme constraints on the system, etc

6.2.1.4 Life Stories

The Afar people are well known for their impressive expression of events and situations, and are good informative. Therefore, during the individual and group discussions and interviews, the researcher used the opportunity to identify individuals with interesting and explanatory stories for further in depth exploration. Accordingly, information such as life memories of good and bad events, coping strategies of crisis, marriage, wealth status, trends in community assistances and similar life experiences were gathered.

6.2.1.5 Structured Interview schedule

Data collected using the structured interview schedule includes, household demography, livestock possession, type of coping and adapting mechanisms used across time, type of emergency and development interventions, perception and rating of interventions, access to socio-economic services and infrastructures.

The use of different data collection methods have enabled to triangulate information and reach saturation point on the require information.

6.2.2 Data collection method

Checklist and standard interview schedule was prepared ahead. One well experienced interpreter and nine enumerators with diploma level education background were selected from the two woredas sector offices. Majority of them were ethnic Afars with good understanding of Amharic and English languages, and all of them can articulate the Afar language and have very good knowledge of the area and the community. Three days training and orientation was given to them on the nature of the study and the prepared interview schedule and checklists. As part of the training, the interview schedule and checklist was tested in near by areas in the study area. Accordingly some modifications were made for final print out.

The qualitative field research was conducted by the researcher. During the first few days it has been some what difficult to generate relevant ideas, but later on it was smooth and was possible to get important views, perceptions, life stories and detail information on historical trends of drought and coping and adaptive strategies based on the checklist. Simultaneously, the enumerators were engaged in collecting the quantitative data using the structured interview schedule. Each evening field level analysis was made by summarizing the information gathered by the researcher as well as the enumerators. After reviewing each filled questionnaire, feedback and suggestion was made for improvement for the next day. Each evening discussion was held with the group members on their impression of the day and some technical assistance was given on how to conduct smooth dialogue with community members.

6.2.3 Data Analysis

The analysis for the data gathered trough different qualitative research methods has been started at field level. The information recorded on the researchers note book were reviewed and checked for verification before another sample village would be visited the next day, and the data has been used as a reference and a supplement to the original checklist to extract meaningful views, facts and information from the next visits. Life stories of selected families, case studies and expressions of the community have been translated and recorded in English. Some information that seemed very confusing and irrelevant at early stage of the field were later flourished and become meaningful in the later stage of the data collection. This process has been followed through out the field research work until saturation point has been reached on all the research questions of the study in all the sample areas.

The limited quantitative information gathered through the structured interview schedule was coded and entered in to computer with Statistical package for Social Sciences (SPSS) soft ware. Then data was analyzed with the help of the software for the required descriptive statistics such as percentage and Chi-square test.

7. Results and Discussion

This chapter presents the results obtained through the qualitative as well as quantitative research approaches of the study. Different perceptions, views, description and reflections of the community and observations of the researcher are indicated in this chapter in detail. Descriptive statistics are also presented on some of the quantitative results.

7.1. Drought and its impacts

7.2. Drought in Aysaita and Afambo woredas

It has been evident that increases in human and livestock population, decreases in available grazing lands and a decline in adherence to social mores have eroded the effectiveness of the traditional means to withstand drought and mitigate livestock asset losses and compromised the food and livelihood security of pastoralist (Solomon *et al,* 2003).Nevertheless, among all factors drought remained to be the most prevalent and least manageable source of the system's shocks in most pastoral systems in Ethiopia. This has no exception for the study area.

Drought is a temporal reduction in water or moisture availability, significantly below the normal or expected amount (norm) for a specified period in a given locality (Christopher, 2000, Patrick and Von Braun, 1994).

Drought has been cited as the number one problem by the community in all the visited sample villages and also in all discussions held and interviews conducted. The community of Aysaita

and Afambo woredas defined drought in terms of different factors, such as shortage and or lack of rainfall, decrease in feed and water availability, prevalence of human and livestock diseases, decrease in livestock number and decrease in vegetation coverage.

The community has identified the following common early indicators of drought.

A. Frequent occurrence of human disease is an indicator of health problem on livestock,
B. When small ruminants start to eat some type of soils, this is an indicator of the poor nutritional value of the available feed sources. This is also an indicator for poor performance of rainfall.
C. Reduction in milk from cows and subsequent death of newly born calves are other indicators of poor condition of livestock which is related to the quantity and quality of feed for animals.
D. More supply of animals, particularly cows to local markets indicates animals are getting weaker and weaker to an extent that they cannot be driven to boarder markets where the price is by far attractive than the local market.

The occurrence of drought has been said to be recognized by the severe shortage of pasture & water, wide spread prevalence of livestock disease in general and internal and external parasites in particular that result in emaciation of animals. Finally, the severity of a drought is determined by high livestock mortality.

In addition, the pastoralists have highlighted that they have different mechanisms where by they know whether the major rains are imminent, such as the cloud, wind, flowering of acacia species, sound of birds, etc.

While drought is a major risk factor affecting livestock-based livelihood, it is not as such drought alone that makes the pastoralist vulnerable, but there are other factors that constrain highly evolved drought-response mechanisms, especially mobility of people and animals, conflict, legal restrictions on trade, and so on. One immediate consequence of drought is to exacerbate the seasonal hunger that is a fact of life in rural communities though out tropical Africa (Deveruex, 2006).

Drought is a part of the normal cycle of life in arid and semi-arid areas, where rainfall is low at the best of times and abnormally low every years. Pastoral livelihoods are sensitively attuned to conditions of low and variable rainfall.

Pastoralists have in-depth knowledge of drought. They remember well all drought events that are named after their specific types of effects. The names given to each drought event differs from place to place or among districts. Following detailed FGDs in all the sample kebeles some of the major drought events that are common to all and well known for their serious effect are indicated in Table one.

Table1: Major drought events in Aysaita and Afambo woredas

S.N	Local name of the drought	Year occurred	Description
1	*Yahuum*	1974	All vegetation cover were dried, no green thing the whole area seemed black stone
2	*Sebasebat*	1981/82	"Awash river became dried". The drought occurred in this time had killed the weaker animals and emaciated the remaining ones. Even the remaining ones had no market value, therefore, we exhausted our resource or finished money from our pocket

Currently, it is not only the increased frequency of drought occurrence that is being hampering the pastoralists, but also the overlapping of droughts with a prolonged duration. The summary of idea of FGD participants of in Aysaita woreda put their idea as indicated in Box 1.

Box 1: FGD in Aysaita woreda Galifage kebele

"*The major difference between the very recent droughts and other drought two decades ago is that the time available to recover from the effect of the previous drought was very short. Whenever drought occurs in one season, it is certain to be followed by a season with satisfactory rainfall and then good pasture that allow fast reproduction of animals. Consequently people would recover soon and return back to their previous wealth status where thy have been before the drought. But now the recurrence and long duration of drought have together deteriorated our environment, in terms of the degradation of grazing lands, reduction of water points, prevalence of both human and livestock diseases and in general hopelessness on many of our community members more than ever before*"

,

7.3. Impact on the range land

In pastoral rangelands, environmental degradation is resulting from a number of factors, including excessive tree and bush clearing for charcoal making, lack of rangeland management, gradual weakening of the indigenous range land management practices, increased sedentarisation due to proliferation and one of the worst prolonged droughts in recent times (Deveruex,2006).

Range land degradation is part of a holistic phenomenon of environmental degradation. Some of the most common indicators of range land condition are, canopy cover of woody plants, basal cover of herbaceous plants, trend of palatable & unpalatable grass/browse species, extent of bare ground, grazing capacity of the pasture land, encroachment by unpalatable woody plants, sustainability of dry season grazing system etc (Amaha,2006)

The major ecological impact of droughts on the range land resources of the study area can be manifested mainly by the pasture and water conditions. The frequent droughts during the last two decades resulted in reduced quality and quantity of feed. i.e. grass, shrubs and trees. Over grazing, especially in the grazing areas, gradually reduced the rangeland's species composition and some traditional grazing lands have been changed to rocky. Deforestation is also another cause for environmental degradation in the area. It is mainly practiced during drought period when sales of fuel wood and charcoal serve as mechanisms to cope with temporary food shortfalls.

Also related to the diminishing of pasture lands, a number of forage species, especially grass species, are disappearing because the recurrence and extended drought did not give time for the dormant seeds of the grass species to germinate. This has been confirmed by the focus group discussions and the community members identified the different grass species that were said to be disappearing and or on the verge of disappearance. Table 2 displays the most commonly mentioned species in this regard.

Table 2: List of grass, trees and herbaceous plants that are endangered due to climate change

Type of plant	Local Name	Scientific Name	Local Name	Scientific Name
Grasses	*Sitabu*	*Cyprus spp*	*Rareita*	*Cynodon dactylon*
	Arki (Serdo)	*Cynodon plyctatchis*	*Asaiso*	*Bothricloa radiens*
	Fiaa	*NU*	*Hamilto*	*Sporobulus spp*
	Sekaito	*NU*	*Denbehu*	*Hyparrhenia spp*
	Elilto	*NU*	*Randaitu*	*Panicum spp*
	Durfu	*Chrysopogon plumulosis*	*Aitiado*	*Tetrapogon cenchriforms*
	Dodob	*NU*	*Skokie*	*NU*
	Mussa	*NU*	*Donhito*	*Eragrostis spp*
	Isisu	*Cymbopogon plumulosis*	*Melif*	*Sehima neruseum*
	Bunket	*Tribulus teristris*	*Malable*	*NU*
	Kaat	*NU*	*Anterbaa*	*NU*
	Surukto	*NU*	*Hamento*	*NU*

Tree / Herbaceous	*Adaito*	*Salvadora persica*	*Kilaito*	*NU*
	Maderto	*Cordia sinensis*	*Merkato*	*Accacia melifera*
	Garsa	*NU*	*Garota / Habi*	*Grewia spp*
	Kusra	*Ziziphus mauritania*	*Sanoita*	*Cassia alexandrina*
	Keselto	*Accacia nilotica*	*Booaita*	*NU*
	Eibbto	*Accacia tortilis*	*Askeraruta*	*NU*
	Udaito	*Balantis ageptica*	*Adebto*	*Grewia bicolor*
	Dawaito	*NU*	*Adado*	*Accacia senegal*
	Unda	*NU*	*Sagento*	*Tamarix aphila*
	Alaaito	*Dobora glabra*	*Hidaito*	*Grewia ferrugnea*
	Subla	*Ficus syncomunis*	*Hamerkuta*	*Blepharis persica*
	Sekokto	*Accacia etbica*	*Tikibleita*	*Accacia seyal*
	Wayaneita	*Prosopis juliflora*		

Source: FGDs August, 2011

N.B

NU The scientific names are Unidentified

The summary of perception of community members about trend of feed availability for different livestock is as indicated in Table 3.

Table 3: **Perceived feed availability**

Species	Feed Availability Trend(% of respondents)			
	Increasing	No Change	Decreasing	Total
Sheep	2.9	5.8	91.3	100
Cattle	0	4.9	95.1	100
Camel	5.8	34	60.2	100
Goat	4.9	37.9	57.2	100

Source: Field survey 2011

The perceptions result indicates that feed availability has been decreasing to all species but particularly to grazers.

Box 2: FGD in Afambo woreda Humadoita kebele

> *During those good old days, when the land is covered by vegetation and becomes green, it means there is plenty out there for our livestock to graze and to drink. This days there is no enough and suitable feed and water no matter how greener the land becomes. This is because of the encroachments of Prosopis juliflora.*
>
> *Therefore, we plea to GOs and NGOs for assistance as our livelihoods is at stake.*

Water is an integral part of range land, and thus decreasing water availability is another important indicator of range land degradation. The most common source of water for human and Livestock consumption is *'Ella'* hand dug well. The water in these wells is found at shallow depth in the wet season, where as in the dry season the depth increases significantly. On of the most difficult task in the pastoral livestock management is watering of animals. Particularly in the dry season this task requires much labor. First the well is dug with the available labor communally and then herders would have access to the water for their livestock in turn. The water is taken out from the well by a container with a capacity of about five liters. The person deep in the water well pours in the water then pass it over to the middle person in turn pass it over to the next person. The process continues until the water reaches the last person who would make the water available to the animals for drink. The process is very laborious and many persons have to be involved.

Table 4: Livestock Feeding Calendar in Aysaita and Afambo woredas

Activities	Sept	Oct	Nov	Dec	Jan	Feb	Mar	April	May	June	July	Aug
Maize tassel ('Biro')					*							
Maize residues ('Qalaito')							*					
Cotton residues ('Girinch')			*	*								
Migration to highland ranges ('Dokaa')									*	*	*	*
Mineralization to Dobie salt lake	*											
Native Pasture	L	L	L	L	L	L	L	L	L	L	L	L

NB. L means the native pasture is very limited

Source: FGD August 2011

7.4. Socio-economic impacts

7.5. Livestock loss and wealth status range category

The number of shoats, cattle and camel possessed by households are the key indicators of wealth status among the pastoral communities of Afar. Cows are considered the most important by most of the pastoralists .This is because lactating cow produces milk. Shoats are the next important animals as they served as ‘liquid cash’.

During FGDs, it has been identified that livestock death in the area is caused by many factors such as, shortage of water, scarcity of feed, out break of diseases, predators and also due to toxic plants. During drought, high animal mortality is primarily caused by shortage of feed, diseases, shortage of water and predators attack, while during normal year the causes are disease, predators and toxic plants in order of importance.

The Afar pastoralists categorized households in to three wealth categories. These are the better off, middle, and poor. But as the category is mainly based on livestock holdings it is not static. One’s wealth status changes with change in rainfall pattern and accompanying change in, the availability of pasture and water. Accordingly, a household which had been categorized as a ‘better off’ some times in the past, might have fallen in to the middle and even to the poor wealth category at present.

As the wealth status determination is done on the basis of relative rather than absolute livestock holding size, the so-called better-off today might be for less wealth than the same category a decade or so ago. In fact the community members themselves confirmed that over all trend of livestock holdings per household among Afar pastoralist has declined significantly over the years. In addition the baseline survey by Save the Children- UK and DPFSB carried out in 2006 has indicated that, during the period of seven years (1994-2000) the population of livestock has decreased due to feed and water shortage, and disease prevalence, mainly as the consequences of drought. On the other hand, the community indicated very recently that the over all population size of livestock has increased as compared to ten to twenty years ago mainly due to the over all increment of the pastoral population.

Related to the trend of livestock holdings, criteria of wealth categorization have showed change over time. The number of animals used to categorize pastoralist as poor, middle and better-off has reduced. Six FGDs have been held to set criteria based on number of animals' possessed so as to categorize household heads into different wealth categories. Then, the result of the six observations has been summarized to construct one criterion to categorize respondents in three wealth groups.

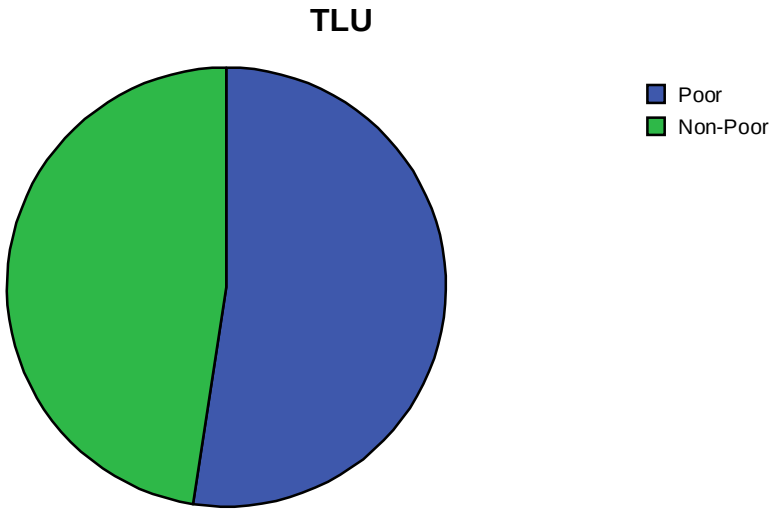

Figure 1: Proportion of Poor and Non-Poor Pastoralists

The community members who participated in wealth ranking exercise were also encouraged to recall how wealthy in TLU holdings those who had comparable wealth status ten years ago were. This was done to get some insight as regard to extent of the decline in livestock holding of the different wealth categories.

Result of the community member's exercise indicated that, ten years ago, pastoralists who had 28 and less TLU were classified as poor and the rest owning greater than 28 TLU the non poor pastoralist. The difference in livestock holding and wealth categorization is summarized in Table 5.

Table 5: Current and a decade ago comparison of livestock holding size and wealth categorization

Wealth Group	A Decade ago (TLU)	Currently (TLU)	Absolute Change (TLU)	%age Change (%)
Better-Off	128.7	89.58	39.12	69.6
Middle	67.1	40.82	26.28	39.2
Poor	27.9	8.52	19.38	69.5

Table 6: Wealth categories, by woreda

Woreda		Poor (%)	Non-Poor (%)	Total
Aysaita (n=32)	Within Woreda	34.4 (11)	65.6 (21)	100
	Across Woreda	20.4	42.8	
Afambo(n=49)	Within Woreda	67.3 (33)	32.7 (16)	100
	Across Woreda	61.1	32.7	
Total (n=103)		52.4 (54)	47.6 (49)	
		100 %	100%	

Source: Field Survey August, 2011

Key informants and FGD participants had made it clear that the proportion of middle and better off or “doing well” class has remarkably decreased, while the proportion of the poor or “struggling” class has increased dramatically, particularly since the last ten years. During the survey the respondents were asked to indicate their livestock possession ten

years ago. Though such data would be constrained by the tendency of idealizing the past, it can give some hint to visualize the trend of the wealth category among the pastoralist. Accordingly, based on the survey result and the criteria set by the community, ten years ago the proportion of poor pastoralist has been only 6.8 percent and the rest 93.2 percent non poor ones.

7.6. Cultural impacts

The Afar culture is constructed around complex social networks that serve a number of social and livelihood related functions. The types of informal transfers or community self assistance are, redistribution of food, cash and productive assets. .

Obviously, the effectiveness of these transfers is affected by the pressure created by the recurrent drought. During the field work of this study many of the interviewed community members had commented on the erosion of the informal social support system as a result of increasing frequency and severity of drought. This is manifested on the on the informal transfers of resources, marriage, and social contribution for religious and other purposes. This issue will be more elaborated in the subsequent sections.

7.7. Indigenous coping and adaptive strategies and their dynamics

Coping strategies are defined as a short-term response to an immediate and in-habitual decline in access to food, and means acting to survive. Coping strategies are useful in the short term, but do not necessarily bring a change in livelihoods (Fasil, et al, 2001). They may not also be economically and environmentally sustainable. Coping strategies can also be identified according to mild, medium and acute stages of drought.

People in vulnerable systems, like pastoralists, are more likely to pursue *adaptive strategies,* seeking to use all available options at all times to survive and to preserve assets for future livelihoods.

Adapting in contrast to coping means a permanent change in the ways in which food is required. Adaptation may take place after each period of severe drought as an attempt to recover after the crisis. When food insecurity has become chronic people might not be able to cope with the situation anymore. This might be the situation when pastoralists have lost their animals and hence their means of primary production. (Ibid)

7.8. Coping Strategies

There are many strategies that have developed over time to mitigate the impact of drought in pastoral communities. These strategies are dynamic and continue to evolve according to the circumstances and resources available to communities. Some mechanisms such as relief food and grain market are two examples of resources that that have been incorporated in to the frame work of the traditional drought coping strategies in recent decades. The managerial and community coping strategies that have been used to mitigate the impact of drought among Afar pastoralists are presented below

7.8.1. Managerial coping strategies

Pasture survey and mobility

This is a livestock based managerial coping strategy. Mobility is an inherent strategy of pastoralists to optimize production of heterogeneous landscape under an uncertain climate. The search for water (for human and livestock consumption) and forage, triggered mobility and migration; these strategies were most intensified by drought.

Migration or the movement of pastoralists with their livestock in search of pasture and or water is both a production system and also coping mechanism to mitigate the effect of drought, Because pastoralists migrate with their livestock both in normal (good) as well as abnormal (bad) years. Nevertheless the extent and pattern of migration differs in both cases. The normal year refers to, when the short rain season *Sugum* (Mid march – mid May) is normal and the long rain season *Karma* is normal to near normal.

The movement during normal year is restricted within the zone, whereas during abnormal years longer distances will be traveled depending on the availability of pasture and water.

Among Afar pastoralists 83 % of the decision as to where and when to migrate is made by elders including religious leaders. To some extent pastoralists also make decisions individually to select the place and time of migration in search of feed for their livestock. From the survey it has been revealed that 86 % of the information source for migration is the while traders and others contribute 7 % each.

As indicated above the community relies on collective decision for migrations are major source of information for the elders to decide migration pattern. Youths purposely selected and sent to bring information from areas where there is little information on rainfall, or it is potentially expected to have pasture. The information system in which the Afar pastoralists transfer the pasture survey result to the community.

Concerning the movement of livestock, it has been mentioned that the more animals you have the more you need to migrate in search of feed and water. It is customary to move with the stock to place where feed and water availability is better when normal dry season comes. Still kids, who are too young to travel long distance, and the mother who looks after the kids are left behind together with lactating animals. However such mobility is possible by those who have many livestock, particularly when animals start to perish, because this group has a high chance of remaining with at least few animals for restocking when the drought ends.

As indicated earlier, the trend of livestock migration out of the zone has increased in the last three decades consecutively. From the total respondents, currently 72 % migrate with complete or majority of their animals in search of pasture, while the proportion who do so ten and 20 years ago had been 50 % and 30 % respectively. The major reason for the increase in the trend of migration of livestock is the decrease in feed availability and water near the original settlement areas of the pastoralists. However, as a general fact, the community has indicated that mobility is related to livestock holding and hence to wealth category. In other words, the better off pastoralist are most likely to migrate than the poor.

Destocking through selling

This is an emerging strategy that is being used increasingly by the pastoralists with drought related problems. In the case of the pastoralists' livestock sale has not been a widely used mechanism. Despite the low price given to animals during drought period, the pastoralists reason for not selling their animals before their price falls is, their tradition of optimistic thinking that pasture might be available else where, and rain may fall and things will get improved where by the animals survive after some sufferings. But unlike their expectation the loss of animals due to drought is very high. Therefore, drawing lesson from their experience, the pastoralists have increased their tendency of destocking through sell to reduce the huge livestock loss during drought.

The survey result on the trend of the livestock sell across decades is indicated in Table 7.

Table 7: Trend of livestock selling as a coping mechanism

	Poor(n=54) %		Non-poor (n=49) %		Total (n=103) %	
	Yes	No	Yes	No	Yes	No
20 years ago	7.3	92.7	12.8	87.2	10.2	89.8
10 years ago	16.7	83.3	18.4	81.4	17.5	82.5
Currently	40.7	59.3	38.8	61.2	39.8	60.2

Source: Field survey August, 2011

According to Ahmed et al,(2001) the poor herders have to sell proportionately more of their livestock on the markets to obtain food than the rich in times of drought; this dependence is exacerbated and accelerates the process of economic differentiation within the society. The result of this study also shows that the poor as compared to the non poor pastoralists used to sale their livestock to cope up with their problems.

Therefore this implies that livestock selling is one of the coping strategies that have been increasingly used by the pastoralists to survive drought related problems through minimizing loss.

Supplementary Feeding

With the decrease in feed availability for animals, pastoralists have used to cut tree branches to feed shoats with the leaves and pods of the trees. With the expansion of this activity to feed animals, deforestation is believed to be aggravated. Particularly, in the bushy areas of Aysaita and Afambo woreda, the pastoralists have indicated that tree cutting has been used as a coping mechanism to feed animals and also make charcoal.

These practice of supplementary feeding of stock with seed pods and branches have mentioned to be used mainly by poor pastoralist with limited number of animals. In most cases the pastoralist with relatively large number of animals used to migrate to other grazing areas. But those with very few animals do not migrate long distance as the probability of losing all is high. Therefore, feeding their animals with branches and seed pods of trees has been a growing practice.

Another forms of livestock based managerial strategies identified in some specific areas during the fieldwork were, the use of traditional practices and plants to treat livestock diseases, and controlling breeding of animals particularly sheep to adjust delivery with the availability of ample feed and water.

Fuel wood and charcoal selling

The other important diversification based managerial strategy used by most pastoralists to mitigate the impact of drought is selling fuel wood and charcoal. Table 8 shows the increasing trend of deploying fuel wood and charcoal as coping strategies.

Table 8: Fuel wood and charcoal as coping mechanism

	Poor(n=54)		Non-poor (n=49)		Total (n=103)	
	Yes	No	Yes	No	Yes	No
20 years ago	5.60%	94.40%	0.00%	100.00%	2.90%	97.10%
10 years ago	18.50%	81.50%	10.20%	89.80%	14.60%	85.40%
Currently	68.50%	31.50%	14.30%	87.70%	42.70%	57.30%

Source: Field survey August, 2011

As indicated on table 14, fuel wood and charcoal selling was practiced more during drought than normal years and also more by the poor than non poor pastoralist. The highly increased use of fuel wood and charcoal selling has resulted in destruction on the remaining trees and bushes. In general this coping strategy is an increasingly used mechanism among the pastoral community.

Meal size, frequency and eating alternative food

According to the culture of the community, adult people usually eat two times a day while children commonly eat three times. But during critical food deficit times the community has verified that the size of meal and frequency will be reduced for all household members. But the reduction starts with adult and then to children.

Eating alternative foods such as, wild animals, wild fruits etc had been practiced by pastoralists few years back. But, currently these foods are not available in almost all the study area, and hence no more can be considered as coping strategies for the pastoralists.

The other type of food used by other pastoralist is blood from either slaughtered or live animals. But, this food has never been used by the pastorlaits.100% of the respondents indicated that they never tried it, as it is forbidden in their religion as well as their culture

Wage employment

Another diversification based managerial strategies of the pastoral community was found to be wage employment. Previously any labor work was less regarded by the pastoralists

as an income source. Therefore no one was interested to work or let other family member work as daily laborer. Because, in case of extreme cases, any member of the community has been entitled to community assistances or local transfers, where by food is given to him. But, currently, the situation forces them to be engaged in any income generating activity that has been neglected by the community.

Table 9: Percent of households used to rent their labour as coping mechanism

Trend of Renting Labour as Coping Mechanism			
	Poor (n=54)	Non-Poor (n=49)	Total(n=103)
Currently	20.40%	18.40%	19.40%
10 Years ago	7.40%	8%	7.80%
20 Years Ago	5.60%	4%	5%

Source: Field Survey August, 2011

About twenty years ago the non-poor pastoralists who had been engaged in labor works as coping mechanisms were only four percent, and the poor 6 percent. Currently, 20 % of the poor and 18 percent of the non poor are engaged or have the interest to participate on labor works to generate income for family.

In addition to wage employment, sending one or more family member to towns or urban centers for wage employment, particularly by poor pastoralist, has been indicated as an emerging mechanism to support the income of the family.

Currently, the survey indicates that about 68 % of the total respondents received food aid during drought as coping strategy to overcome food shortage. However the type and

relevance of the food aid package given to the community is another major issue that will be discussed in the next chapter.

7.8.2. Community strategies

Gift of milk and lactating animals for needy community members during shocks or crisis has been the major community based strategy among the pastoral community of the area. However due to effect of the drought that affects the larger community at a time, the trend this strategy has been indicated to be decreasing dramatically.

Another form of community strategy identified was remittance from relatives living abroad. In this case, it has been found to be an increasing mechanism particularly for those community members living round administrative centers as compared to those in remote areas.

7.8.3. Adaptive Strategies

Over the past five decades Pastoralism as a social and economic system has rapidly become less prevalent. The major causes of this decline are the need to put more land under crop, the contending demands placed on scarce resources, the advent of large scale commercial and state owned agricultural enterprises, as well as the growing economic importance of national parks designed to promote the tourist industry (Ayalew, 2001). People in vulnerable systems, like the pastoralists in Afar and Borena, are more likely to pursue adaptive strategies, seeking to use all available options at all times to survive and

to preserve assets for future livelihoods. Adapting in contrast to coping means, a permanent change in the ways in which food is required. Adaptation may take place after each period of severe drought as an attempt to recover after the crisis (Fasil *et al*, 2001)

7.8.4. Change in food habits and dependence on grain market

As a response to short term and long term food shortage Afar pastoralist have been inducing changes in their diet and feeding frequency. The staple foods of the community are baked maize flour with milk which is locally known as "Afar *Gaqambo*", milk and meat. Pasta, Rice and Macaroni are also commonly used foods.

Reduction in availability of milk and ghee at household level, which resulted from drought, has been another factor that forces pastoralist to depend on cereals from the market. The poor price of livestock due to the drought and the high price of grain led also to the sell of more number of animals at low price in order to satisfy the family need. In other words the community are becoming more dependent on grain market than what had been ten and so years ago.

Another study conducted in Afar region has indicated that the community has similarly induced change in food habit from milk to *Injera.*

7.8.5. Community self help and social customs

The Afar pastoral community, like other pastoralists, has a well known social capital where by they assisting each other in difficult times. The religious contribution called *Zakat* is one way where by the better of household supports the poor ones. Other mechanisms, include, contribution of animals particularly shoats for restocking, provision of milking animals and contribution of milk. Borrowing money has been also another source of assistances. Such and other community assistances were very usual in assisting the community members who face with different man made and natural disasters.

However, different group discussions made with the community and also the survey indicated that such social capitals of the Afar pastoralists are dwindling from time to time. Previously before two decades, when the proportion poor pastoralist had been insignificant as compared to the proportion of middle and better-off ones, the community used to manage problems on their members through their informal transfer mechanism. What ever the type of shock either natural or not, any one of the community member would have been assisted well by the community. But, in recent years, the ability to practice the custom of assisting each other has been declining.

Apart from the direct assistance received from relatives of the community members, pastoralist who faced acute problems had used to borrow money from better-off‘s, to pay back at good times by selling animals with good price. But nowadays borrowing money particularly to the poor people has been difficult. In this regard, the survey indicated that

the trend of borrowing money to cope up problems during drought has shown significant decrease as compared to the last decade. About ten years ago, 33 % of the respondents have used to borrow money, while currently this figure has reduced to only 11 %.More over, in terms of wealth category the current study indicated that the poor gets les access to credit from the community members as compared to those respondents in the non-poor category. Ten years ago, 41% of the total poor (54) had used to borrow during drought, while only 25% of the total non-poor (49) did so. This clearly indicates that the poor had access to credit whenever they need.

Accordingly, with increase in the extent of the drought related problems, borrowing money as a coping strategy could have been increased among the poor. Nevertheless, the survey indicated that the situation is vice versa .i.e. currently the proportion of respondents who borrowed money is, 9 % of the poor(54) and 14 % of the non-poor(49). Obviously, this implies that those people who have relatively better TLU have trust by borrowers and hence access to credit when ever they face crisis.

According to Deveruex (2006), three explanations were given for why the informal transfer mechanisms are less able to deliver effective social protection to the poor and vulnerable these days than in the past:

1. Less capacity to provide support (because of poverty, exacerbated by “equalizing” shocks
2. Less willingness to provide support(because of cultural change- declining social solidarity)
3. Reluctance to ask others for help (because of” social costs”- shame and stigma)

In general with recurrent drought and other constraints that are affecting the pastoralist, they are forced to induce changes on, their self help and social customs. Accordingly, to adapt the changing situation, gifts of milk and animals, borrowing money and also number of animals required to marry wife have been declining over time.

7.8.6. Modifying herd structure

The decline in the livestock, has been viewed from the different species of animals point of view so that to understand the trend of the herd structure. Accordingly, as it is discussed above the change occurring on the feed availability for the different species is found to be different. Hence, the decrease in feed availability resulted in a corresponding decrease of the species. Accordingly, even though there is an overall reduction in the feed availability, feed availability is decreasing highly for sheep followed by cattle and then goat and camel in order of priority.

Due to lack of comprehensive longitudinal data on livestock holdings, it might be difficult to indicate the exact trend of herd structure in the last few decades. However, as it is indicated in table eight, the perception of the community has indicated that feed

availability for grazers(sheep and cattle) is highly decreasing, while it is also decreasing for browsers (Camel and goat)but relatively to lesser extent than for the grazers. This implies that the pastoralists in the two woredas, like other pastoralists do, are forced to modify their herd structure with a much emphasis on browsers than grazers to fit the environmental change that resulted from the recurring droughts.

7.8.7. Urbanization

One of the major issues observed during the field research is the high increment of population in a previously existing administrative kebeles and also the establishment of new kebeles with new settlers. Majority of the settlers in both cases are found to be people who are on the verge to drop or completely dropped livestock production in a recent times. Discussions made with the two Woreda administrative officials and contacted community leaders have verified that concentration of pastoral people around kebeles has increased particularly during the last ten years.

Some important factors have been identified for such urbanization. First, during sever droughts when most of the pastoral community lost majority or all of their livestock, in this case as the problem is the same for all, the efficacy of assisting each other will be insignificant. Hence people will move to administrative centers where the attention of outsiders is plenty. Accordingly, the provision of relief food aid and related emergency services through this government structure has highly contributed for the increasing number of settlers and also establishment of new administrative centers. The case of one

community member who had dropped out pastoralism and settled in administrative kebele is indicated below in Box 3.

Box 3: Life story Aysaita woreda Gairani kebele

Just before the worst drought Sebasebat I had 180 goats, 220 sheep, 70 cattle 16 camel and seven donkeys. I had three wives and 12 children. When the drought gets severe and sever, I lost half of the animals on my way to and from Somali land. Added to effect of the drought, my elder wife passed away for a week time disease. When I return to my original place the situation was even worsen than the previous except the start of food aid and water for people. Hence, leaving my family behind, I again migrated to the high lands of 'Dokaa' (Gabiee Rasu) with the remaining animals. Here the situation was better that helped animals to survive. Finally when I returned home i was left with 25 cattle and six camels. Unfortunately one of my other wives and two of my sons were seriously sick. Hence, I sold all the remaining animals for little money and took the family to Aysaita Health Center, and come back with a remaining little money. From that time onward I settled in this kebele and started teashop with my wives.

Apart from those destitute pastoralist who have lost all or majority of their animals have nothing to do by staying out far in grazing areas and or migrating from place to place. Rather, they aggregate to kebele administrative centers and try different activities such as petty trade, wage employment and charcoal and fuel wood selling on regular basis.

In addition to the emergency crisis management, most of the development initiatives (Water, Health, Education etc) in the study area are implemented based on administrative centers that attract more people to settle around.

7.8.8 Emergence of Agro- Pastoralism

Quite often, pastoralist tend to engage in cultivation as an adaptive response among other activities, when internal and external factors make livestock husbandry difficult and this mode of livelihood is in crisis (Ayalew, 2001).As an adaptive response to the changing circumstances and the gradual decline in their pastoral mode of subsistence, some pastoralists have started to practice crop production to some extent.

With the exception of Afambo woreda, where agro-pastoralist has been practiced by the majority of the community since long time ago, Aysaita woreda in general and the later in particular were known by their pure pastoral production system where people depends for their livelihoods on their livestock.

In analyzing the trend of adopting crop production among the pastoral community of Aysaita woreda, respondents were asked whether they have been producing or have tried to produce crops across time. However, increased proportion of crop production does not necessarily entail the adoption of agro-pastoralism as an adaptive strategy. Because, what matters is not the number of the pastoralist who have produced or tied to produce, rather the proportion of those who continued to produce and supplement their livelihoods from the production.

Those pastoralists who have once started to produce crop did not keep up on it. Box 4 presents the summary of FGD held with a group of pure pastoral people in Aysaita woreda, Galifage kebele who have once tried to be engaged on crop production.

Box 4: FGD with pastoralist adopting agro-pastoralism in Aysaita woreda Galifage Kebele

About Five years ago, after the drought has finished almost all of our animals, some 100 people have come together and agreed to start cultivation in this kebele. Then we contributed money, fenced large area, leased oxen, ploughed and sawn maize with the help of hired farmers.

From the very beginning we faced so many problems such as, lack of technical knowledge, farm tools, etc. we found it very laborious. Then we sent our representatives to woreda, zone and regional administration and bureau of Agriculture for any possible technical as well as material support. But we did not get any support. And finally the maize has completely dried due to moisture stress and the group has dispersed as we ended up with further losses of our money and

The most common problems identified during group discussions as constraining factors to adopt agriculture as supplementary to livestock production were, moisture stress, lack of knowledge on farming, lack of tools & equipment, and lack of inputs.

Box 5; FGD with pastoralists in Aysaita woreda Rumaito kebele

> *Recently some of our community members have the interest to start crop production. Accordingly the first step taken is to fence a certain land with locally available materials. But this is against the communal use of land for grazing. The more land fenced for the purpose of cropping the more land we lost for grazing.*
>
> *Of course most people who fenced land and tried cultivation are not satisfied with the result. But had it been an effective occupation people might keep up on expanding their holdings, and this will in the long run minimizes our grazing lands*

Another aspect of adopting crop production was the issue of land ownership. The expression presented in Box 5, indicates that with the expansion of crop production, the need for private land ownership will increase, which is obviously considered as a future threat on the communally owned grazing lands in turn will affect

In general despite its emergence as an adaptive strategy, agro-pastoralism is constrained by factors such as lack of knowledge, and skills by the pastoralist in one side and lack of proper support from outsiders and moisture stress in the other side.

8. Major findings and discussions

Patterns of the local climate

Analysis of the patterns of the local climate (rainfall and temperature patterns) in the study area over the last five decades reveals that there has been increased rainfall variability and temperature rise. Rainfall distribution in the area is generally characterized by high degree of inter-annual variability. Further, analysis of the linear trend of annual rainfall indicates a slight increase in Aysaita and Afambo woredas. According to NMA (2007), the average annual rainfall trends in the past four or five decades showed a declining trend in the Afar lowlands and other water stressed regions of the country.

The temperature pattern also shows an increasing trend of warming in all the three areas over the past decades. It is well recognized that small increases in temperature can result in measurable impacts on the health of human beings and livestock as well as the availability of water, food and feed resources.

Hence, the changes in the patterns of rainfall and temperature have already created pressure on the available water, forest, and range resources thus exacerbating food and feed shortages and making the environment more vulnerable and less resilient to future climatic changes. As a result, the people in the area are exposed to the risks of several climate related hazards such as drought, flooding, and epidemics.

Climate change-induced hazards

Drought

Although drought is not a new phenomenon in the study area, it has become severe and frequent in recent years. As compared to past decades, the drought cycle is repeated almost every year or two, giving no time to recover from its impacts. Particularly, the last ten years have seen more frequent and prolonged droughts. During the recent drought, the rains were not only insufficient but also extremely unpredictable. For example, the rainfall during the main rainy season of 2008 was late by more than two weeks and stopped too early. The rain lasted from 2 to 15 days in most of the places of the study area and there were some areas that have not received rainfall at all.

Flooding

Many places of the study area are prone to the risks of flooding. In particular, Aysaita woreda is most flood-prone as it is drained by big perennial river Awash that descend from the humid central highlands of the country. Repeated flash and seasonal floods from the Awash River have caused widespread destruction of life and property and massive displacements. For instance, in August 2010, the floods in Aysaita Woreda caused the death of 4 people and 300 heads of livestock and the displacement of over 1,000 people. The floods also destroyed several villages, infrastructure, and agricultural fields. In Afambo Woreda also, flooding of the Awash river caused the displacement of 400 people and destroyed about 400 ha of cropland. Further, the floods hindered land preparation activities for the next cropping season in the area. In addition to direct loss of life and

property, the floods have led to the outbreak of fatal diseases such as diarrhea and malaria.

Figure 2: Animals affected by drought (Aysaita)

Diseases and pests

Climate change has direct and indirect impacts on the prevalence and spread of diseases and pests. Over the past years, the area has experienced increased incidence and spread of diseases and pests. Further, the changes have led to the emergence of new human, livestock and crop diseases types that have never been known in the area. The causal link between climate change/variability and outbreak of human diseases such as malaria, cholera, Rift Valley Fever and meningitis is established (Bouma et. al., 1997; Haines et. al., 2006; McMichael, 2006; Sachs and Malaney, 2003). In the study area, malaria is a common disease in Aysaita and Afambo Woredas. However, in recent times the disease is widely spreading in other areas that have been least affected before, for example in Aysaita Woreda. Even in places where malaria was common, the disease has become

more severe and fatal. Furthermore, the community indicated that new diseases, which include cold, respiratory and intestinal diseases, are affecting them.

The prevalence of livestock diseases has also intensified and caused increased loss of livestock, decline in their productive and reproductive capacity, and reduced market values. More than 70% of the households in Aysaita and 81% in Afambo indicated that livestock diseases have intensified in recent years as compared to the past. With recurrent and extended droughts, existing and newly emerged livestock diseases are causing more illness and livestock deaths. These newly emerged diseases affect camels and goats, which are considered as most resistant to droughts. During severe droughts household are forced to move their livestock to distant places, potentially exposing their herds to different environments with health risks to which they have never been exposed. Changing patterns of the local climate has caused crop damages and failures due to climate change.

Impacts of climate change-induced hazards

Impacts on livelihoods and social relations

The hazards induced by climate change have diverse impacts on the people and the environment. The changes have had serious impact on livestock and crop production in the study area over the past years. Droughts and diseases are resulting in loss of livestock and erosion of basic household assets. Households have experienced considerable loss of livestock during the past years. In Aysaita, for instance, the average number of livestock per household has declined from 10 oxen, 35 cows and 33 goats 20 years ago to 3 oxen, 7

cows and 6 goats at present. Similarly, in Afambo the number decreased from 30 cows, 38 goats and 36 sheep 20 years ago to 21 cows, 23 goats and 21 sheep at present. Shortage of adequate fodder and underfeeding of animals increased vulnerability to disease risks associated with drought and climate stress. The problem is exacerbated by shortage of veterinary services and poor infrastructure. According to informants in two woredas, the decline in animal productivity and reproductive capacity is the most serious risk they are facing today. They narrated their experience in terms of underfeeding of animals and falling productivity.

> *….in the past we had good pastures around. Now the fields are barren and availability of pasture is limited to few pockets. In the past, a young cow used to conceive at the age of three years and gives birth to calves frequently. Now cows stay four to five years without conceiving. They do not give us as much milk as we need. Even if they do give birth to calves, they can't feed them, let alone provide extra milk for us. In addition, the aroma, taste, color and thickness of the milk has changed and become poor quality.*

Impacts on women and children

Women and children are most vulnerable and affected by the impacts of climate related hazards. The hazards create additional burden on women as they have multiple household responsibilities. For instance, in Aysaita Woreda, women have to spend on average 12 to 14 hrs a day to fetch water and fodder for small ruminants and calves during drought years. Children, especially girls, are forced to drop out of school during droughts and

flooding. Recent flood in March/May 2011 have caused massive displacements and over 1,500 children were forced to drop out of school in Aysaita woreda of Galifage, Rumaito, Handeg and Wanis kebeles. Further, in some places of Aysaita and Afambo woredas where there happens chronic food shortage, young children assist their parents by collecting wild fruits and roots for household consumption and to generate income.

Figure 3: The multiple responsibilities of pastoral and agro-pastoral women in Afambo

Impacts on the environment and natural resources

The aggressive encroachment of undesired thorny and woody species on grazing areas has resulted in the degradation of rangeland resources. Bush encroachment is particularly severe in Aysaita and Afambo woredas. Estimates indicate that about 40% of the Afar rangelands were affected by bush encroachment by the mid-1980s (Assefa et al., 1986; Coppock 1994). According to survey results, about 90% of the households in Aysaita and 75% in Afambo indicated that the condition of rangelands is deteriorating over time. Most of the high potential grazing areas particularly in Galifage, Handeg and Rumaito areas of Aysaita woreda and Kutubla kello, of Afambo woreda are heavily degraded. The

replacement of productive and high value grass species with low quality feed resources and unpalatable weeds have greatly reduced pasture availability and quality.

Table 10: Condition of rangelands over time (% of the responses)

Condition of range lands	Aysaita	Afambo
Deteriorated	91	89
Improved	4	9
Remained the same	6	2
Total	100	100

Source: Field survey August, 2011

Discussions held with informants and experts in the study area confirmed that bush encroachment is the single most important factor degrading range resources. According to them, the problem appears to be beyond their control and has become a serious threat to livelihoods. It is widely believed that the official ban on bush fire by the government in the 1970s has facilitated the process of bush encroachment in the area (Bille and Eshetu, 1983; Corra, 1986; Coppock 1994). According to pastoral elders, the loss of these species has reduced milk yield and quality while also exposing livestock and goats to diseases which some of the types could be fatal. The changes in the climatic system have also caused reduced water availability in wells, ponds and springs. In the study area, stress from water scarcity is increasing over time. During drought years, pastoralists should travel to distant places to graze and water their livestock. On average, in the past three years a pastoral household in Aysaita needs to travel for 30 kms to get access to good pasture and 26 kms to water livestock. The corresponding figures in Afambo are 27 and 24 kms.

Table 11: Average distance travelled (km) to get water and pasture for livestock

	To water livestock		To get pasture	
	Aysaita	**Afambo**	**Aysaita**	**Afambo**
Drought season				
During the last 3 Years	18.4	24.4	18.6	27.4
During the last 10 years	12.9	20.0	12.5	21.6
During the Derg period	19.8	16.1	17.2	12.5
Non-drought years				
During the last 3 Years	7.2	14.9	7.7	14.7
During the last 10 years	9.3	10.7	12.8	10.4
During the Derg period	8.8	25.8	9.0	5.0

Complicating factors

The impacts of climate change does not just depend on the actual variations in temperature, precipitation etc. themselves, but also on the social and economic systems of affected communities to cope with the impacts of the changes. In addition to the direct impacts of climate change induced-hazards, various other factors complicate the problem and reduce the adaptive capacity of communities to the changes. The main complicating factors in the study area include weak livestock market, lack of preparedness, demographic pressure, unfavorable socio-cultural practices, lack social services, lack of education and early warning information. The physical and market infrastructure in the area is poorly developed or non-existent, and the main market places are not within easy

reach of most of the households. On the other hand, during drought years, the price of cereals rises while that of livestock falls thereby worsening the terms of trade for pastoralists. Although early warning units and committees are present at the Kebeles and Woreda levels, they are poorly organized and inefficient with negligible impact. Lack of awareness and limited availability of educational and health services constrained communities to prepare against and adapt to the impacts of the changes. In the study area, there are unfavorable socio-cultural perceptions and practices which make some household members more vulnerable to the impacts. For instance, women lack control over important household assets such as cattle and camel, land, and cash reserves for use at times of severe disasters.

Responses to climate change

Local/Community responses

Households and communities in the study area employ a range of indigenous strategies to cope with the changes and/or adapt to it. In response to the degradation of rangelands and declining livestock productivity, crop cultivation has spread to areas that have never been under cultivation. Opportunistic farming is used to avoid the potential risks of sole dependence on livestock. With severe droughts and other climate related risks, households have become increasingly under pressure to sell or exchange their livestock. According to survey results, about 78% of the households in Aysaita 84% in Afambo reported an increasing trend of livestock selling since recent times. Normally, households start responding to the problem by selling small ruminants, mainly goats and sheep.

However, with increased intensity of the hazards, they are forced to sell cattle that are the main sources of their livelihoods and social prestige in the community.

Resource sharing is a tradition that has long been used as a safety-net mechanism to support vulnerable members of the community to cope with the disasters. Established mechanisms of support range from simple sharing and provision of milk and other food items to contributing heads of livestock in order to restock the herds of affected families. Households who received the support in turn contribute to the community by helping others though labour work and livestock herding demonstrating mutuality in the support system. Income diversification is another emerging coping strategy in the area. Such activities range from daily labor in urban areas and commercial farms to selling of charcoal, firewood and wild fruits. Women mainly conduct petty trade while few young men involve in farming and cross border trading. During acute disasters, households change their normal food intake and adjust their consumption to the available household resources. Consumption smoothing usually involves adjusting diets to cheap food items, supplementing with edible wild plants and fruits, and reducing the amount and frequency of meals.

Pastoralists traditionally use varies types of resource management strategies to cope with and adapt to changing climatic conditions. Rangelands are divided into different uses, such as dry and wet season grazing, considering the season and nature of the climate. These practices are undertaken to avoid overgrazing, allow regeneration of pasture, and in response to climatic variations within and between months in a year. The grazing

pattern is regulated by availability of water, pasture, and the size and structure of herds. Traditional institutions make decisions regarding which resources (rangeland or water) to use when and by whom. Herd diversification and splitting are used as coping strategies against the impacts of climate change and variability. Diversification offers sustained supply of various livestock products, allows the manipulation of different ecological potentials of livestock, and helps to spread risks associated with changing climatic conditions. In general, there is a shift from the production of grazers (cattle and sheep) to browsers (camels and goats) as browsers are relatively drought resistant. Herd and household mobility as a flexible mechanism to cope with impacts of climate change. Mobility is used to optimize the utilization of natural resources and in response to emergencies such as disease outbreak, flood, drought and conflict. Although long distance mobility is a long-standing tradition of the pastoralists, its duration and frequency has hanged in response to increased climatic tress. Long-distance and extended mobility has gradually been replaced with short-distance and frequent movements.

Nevertheless, with increased intensity of the problem and its impacts, the traditional coping mechanisms are becoming obsolete or incapable to reduce damages and build their resilience. Some of the strategies such as cultivation of unsuitable areas, overgrazing, charcoal making and fuel-wood selling are not only unsustainable but would also cause further degradation and desertification. Hence, institutional support is vital to reduce impacts of the hazards and curb unsustainable trails of household and community responses against the impacts.

Institutional responses

Various NGOs operate in the study area with invaluable contributions in terms of land management, water harvesting practices, rangeland rehabilitation, micro-finance and credit schemes, conflict resolution, etc. They have been particularly designing and implementing development projects related to asset protection, livelihood diversification, social service provision, natural resource management, and disaster risk reduction. Though the contributions are encouraging, most of these efforts suffer from lack of cooperation and fragmented approaches. Furthermore, climate change is not well integrated and factored in the development activities of the NGOs. This coupled with short project duration to address proximate impacts has in some cases led to the promotion of inappropriate and unsustainable technologies.

The government has also a significant role to play. Indeed, the government of Ethiopia has adopted policies, strategies and action programs aimed at poverty reduction, environmental protection and sustainable development. However, the country has no an explicit policy on climate change yet. The threat of climate change as a development agenda is hardly captured in most of the policy and strategy documents. Instead, government response has been sectoral, short lived and biased towards emergency aid which in most cases is insufficient and not delivered on time. The early warning system of the country is narrow in its approach and is biased towards capturing the threats of drought and food insecurity in an emergency situation. In addition, lack of synergy among the various sector offices has hindered integrated and collaborative efforts to

effectively mobilize communities and manage their resources. Without strong coordination and cooperation between all actors and stakeholders, and creation of operational synergies, neither the indigenous coping strategies nor the interventions of external actors will sufficiently address the complex impacts of climate change.

9. Conclusion and Recommendations

9.1 Conclusion

Ethiopia is one of the poorest countries most vulnerable to the impact of climate change. Although symptoms of the problem are widespread in many places of the country, the Afar lowlands are most affected and will suffer more. Historical climate data in the area reveals that there has been increased rainfall variability and temperature rise. As the result, the people are exposed to the risks of several types of disasters such as drought, flooding, epidemics, wildfire and pestilence. There is increased frequency and spatial coverage of the hazards; existing hazards are intensifying and new types are emerging with deleterious effects on lives and resources. Chronic food shortages, unstable livelihoods, and conflict over increasingly scarce and fragile resources major impacts of the disasters. Repeated flash and seasonal floods have caused considerable destruction of life and property and induced massive displacements. Moreover, the incidence and spread of diseases and pests has intensified; new human, livestock and crop disease types that have never been known in the area have emerged. Camels and goats, which are normally considered more resistant to droughts and diseases, are affected by newly emerged and unidentified diseases. Crop damage has become widespread due to pest infestations and occurrence of new types of pests and worms. The disasters have caused increased vulnerability to poverty, food insecurity and loss of productive assets. For instance, the

number of livestock held by pastoralist households has shrunk over the past two decades. Shortage of adequate fodder and underfeeding of livestock reduced not only the number of livestock but also productivity and resistance to diseases. The problem is exacerbated by shortage of livestock health facilities, services and poor infrastructure. The impacts of the hazards transcend beyond mere decline in crop and livestock production, rather become the cause of tense social relations triggering ethnic and tribal conflicts. In the study area, the conflicts have intensified over time as available resources shrunk due to climate change and lead to the loss of human lives and property. Women and children are particularly most affected due to the changes in many respects. Weak livestock market, lack of preparedness, demographic pressure, unfavorable socio-cultural practices, lack of education, health and other social services, poor infrastructure, and weak early warning information complicate the problem.

Households and communities employ a range of indigenous strategies to cope with the changes and/or adapt to it. However, the strategies are becoming incapable to reduce damages. Some of the strategies such as cultivation of unsuitable areas, overgrazing, charcoal making and fuel-wood selling are not only unsustainable but would also cause resource degradation and desertification. Hence, institutional support is vital to reduce impacts of the hazards and curb unsustainable trails of household and community responses against the impacts. Various NGOs operate in the study area focusing on land management, water harvesting practices, rangeland rehabilitation, etc. The projects of the NGOs have invaluable contributions in relation to household asset protection, livelihood diversification, social service provision, natural resource management, and disaster risk

reduction. Though the contributions are encouraging, most of these efforts suffer from lack of cooperation and fragmented approaches, short project duration, and weak cooperation among each other. On the part of the government, there are various policies, strategies and action programs aimed at poverty reduction, environmental protection and sustainable development. Unfortunately, the country has no an explicit policy on climate change nor does climate change well captured in the existing policies. Government response has instead been sectoral, short lived and biased towards emergency aid.

9.2 Recommendations

Focus on shift from technology to people: The impacts of climate change-induced hazards fall disproportionately on the socially venerable and least adaptive small farmers and livestock herders, thus making adaptation to climate change impacts a matter of urgent need, social justice and of empowerment. After all development is about and for people. Projects based on technical inputs and top-down, exclusionary decision making processes are bound to fail. Participation and enablement is the key to success, allowing small farmers and pastoral households to accrue the benefits from an improved, and more sustainable and secure livelihood. It is therefore important that both governmental and non-governmental institutions work realistically together to make their development interventions people focused, participatory and enabling.

Promote research on heat tolerant, disease resistant and early maturing crop varieties so as to help vulnerable pastoral and agro-pastoral households avoid the risk of sole dependence on livestock and drought prone or less heat tolerant temperate and disease prone crops. In this case, diversifying seed and genetic structure and composition can be

an effective defense against numerous climate related hazards including diseases and pests.

Develop integrated/holistic disaster risk reduction and early warning system: The early warning system of the country is narrow in its approach and is biased towards capturing the threats of drought and food insecurity in an emergency situation. The system should be reoriented and broadened to capture other emerging threats to livelihoods and ecosystems from climate change induced-hazards in the country including floods, human, livestock and crop diseases, pests and noxious weeds.

Focus on raising awareness, knowledge management and information dissemination: With the growing feeling and revealing local evidences that climate change is already occurring and affecting pastoral and agro-pastoral communities in the southern lowlands of Ethiopia, there is strong need to raise awareness and disseminate relevant information in order to have all stakeholders involved understand the multifaceted impacts of climate change and the urgency of factoring it into their development programmes and actions.

Focus on feed rehabilitation and integrated rangeland management*:* Establish regular supervision and monitoring of range condition, vegetation type, and productivity and management problems. Ii is vital to recognize and integrate traditional range management knowledge and practices (rotational grazing, herd diversification, splitting and flexibility), area enclosure, dry season reserves, alternative feeding and hay making practices.

Focus on animal health and disease prevention and control: In view of the expansion of animal diseases and the emergence of newly emerging varieties, it is crucial to develop systematic monitoring and periodic assessment systems, and disease prevention and control programs.

Protect assets and build and diversify local livelihood options*:* Protecting vital livestock, range and environmental resources is crucial to develop local adaptation capacity, resilience and resistance to the impacts of climate change-induced hazards. Given the diverse impacts of climate variability and change, it is also equally important to broaden available livelihoods options to diversify income streams, absorb surplus labor, reduce over-dependence on livestock or natural resources, and reduce exposure to climate shocks. Alternative livelihood sources with focus on non-pastoral livelihood options including the protection and collection of non-timber products (gums, incense, etc…), bee keeping, opportunistic farming, poultry, petty trade and other urban-based income-generation activities which can cut unsustainable production and the immediate daily dependence on natural resources.

Target and empower women and other vulnerable groups: Women in the study area are both victims and active managers of their local environment. Their role in the spheres of the household economy and the reproductive and productive arenas is innumerable and immensely critical. The deterioration in the productivity or carrying capacity of the rangelands or environmental resources will affect them first. Measures that empower women in decision making in the household and community spheres are very important and urgently needed.

Promote climate friendly development initiatives: Development actors in the area should factor climate change as a major component of their activities. It is necessary to consider local realities and sustainability issues in the design and execution of development projects and programs. Furthermore, collaboration among the various development actors operating in the area is imperative in order to streamline activities, effectively manage human and financial resources, and successfully meet intended objectives.

Build local capacity: Building local capacity to collect, analyze and interpret climate data and share results at the local and national levels will improve local weather forecasts, seasonal climate predictions, risk, and impact assessments. There is also need for interdisciplinary research and knowledge management to boost understanding on local adaptation, livelihood enhancement and mitigation options.

Mobilize adequate and stable financial resources: Strengthen the capacity of relevant government institutions in order to secure available funds from international donors and be able to effectively and efficiently utilize to build the resilience of vulnerable communities and ecosystems to the impacts of change.

REFERENCES

Afar Regional Agriculture Bureau (ARAB) 2000, unpublished document, Afar Forestry Action Plan, Aysaita, Afar.

Afar Regional Pastoral Agriculture and Rural Development Bureau (ARPARDB), 2010(Unpublished) issue papers. Afar and Climate change, Semera, Afar.

Astrid Von and Ailsa Holloway, 1999 Living with Drought: Drought Mitigation for Sustainable Livelihoods. Intermediate Technology Publications Limited. London.

Boko, M., Niang, I., Nyong, A., Vogel, C., Githeko, A., Medany, M., Osman-Elasha, B., Tabo, R., and Yanda, P. 2007. *Africa. Climate change 2007: Impacts, adaptation and Vulnerability. Contribution of Working Group II to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change.* Cambridge: Cambridge University Press.

Bureau of Finance and Economic Development (BoFED) 2008, Demographic and Socio-Economic Profile of Afar National Regional State, Semera, Afar.

Bureau of Finance and Economic Development (BoFED) 2009, Regional Atlas of Afar Region, Semera, Afar.

Daniel Rotich Kandagor 2005, Rethinking Pastoralism and African Development: A case

Study of the Horn of Africa. Egerton University, Nairobi, Kenya.

Denis Herlocker 1999, Range Land Resources in Eastern Africa: Their Ecology and Development, Nairobi, Kenya.

Deutscher Tropentag , Adaptive Strategies of Pastoralists Stuttgart, October 2005. Conference on International Agricultural Research for Development http:// www.tropentag.de /2005/ abstracts / full / 197.pdf. (Retrieved on February 12, 2011 from the internet.)

Eriksen, S., O'Brien, K.L., and Rosentrater, I., 2008. *Climate change in Eastern and Southern Africa. Impacts, vulnerability and adaptation.* Report prepared for the Norwegian Agency for Development and Cooperation, University of Oslo, Oslo.

Fasil Kebebew, Diress Tsegaye and Gry Synnevage, Traditional Coping Strategies of the Afars and Borena pastoralists in response to drought. Dry lands Coordination Group Report No, 17, November 2011, Norway.

Getachew Kassa Dimensions of Pastoral Poverty in Ethiopia. In poverty Reduction and Pastoral Development. Proceeding of the 2nd Annual conference on Pastoralist Development in Ethiopia, May 22-23, 2001. Addis Ababa, Ethiopia.

Ghosh, Forecasting drought in Ethiopia, Bomikhal, Bhubanswar, India, (2001)

ICRC, Regional Livestock Study in the Greater Horn of Africa, Nairobi, Kenya,(2005)

IPCC, 2007. *Climate change 2007: The fourth assessment report of the Intergovernmental Panel on Climate Change*. Cambridge University Press, Cambridge.

_____ 1996. *Climate change 1996: The second assessment report of the Intergovernmental Panel on Climate Change*. Cambridge: Cambridge University Press.

_____. 2001. *Climate change 2001: The third assessment report of the Intergovernmental Panel on Climate Change*. Cambridge: Cambridge University Press.

J. Ensoor and R Berger2009, Understanding Climate Change Adaptation. Lessons from Community Based Approaches. London.

McMichael, A., Campbell-Lendrum, D. and Kovas, S. 2004. Global climate change. *Comparative quantification of health risks: Global and regional burden of diseases due to selected major risk factors.* M.J. Ezatti. Ed. Geneva, World Health Organization.

Ministry of Finance and Economic Development (MoFED) 2011, Growth and Transformational Plan of Ethiopia, (unpublished) Addis Ababa, Ethiopia.

NASA. 2001. Climate change and extreme weather events. Implications for food production, plant diseases and pests (Available on http://www.pubs.giss.nasa.gov/abstracts/2001/Rosenzweig-etal.html).

NMSA. 2007. National adaptation programme of action of Ethiopia (NAPA). Final draft report. National Meteorological Agency, Addis Ababa.

Pankhurst, R. 1966. Some factors influencing the health of traditional Ethiopia. *Journal of Ethiopian Studies*, Vol IV (1): 31-70.

Pastoral Community Development in Ethiopia, 2001(Unpublished) issue paper. Prepared for the Pastoral Extension Team of the Ministry of Agriculture with the support of FAO and the World Bank.

Pastoralist Forum Ethiopia (PFE), Proceedings of the Roundtable on Drought and famine In the Pastoral Regions of Ethiopia, December 23-24, 2002, Addis Ababa, Ethiopia.

Patz, J.A., Campell-Lendrum, D., Holloway, T. and Foley, J. A. 2005. Impact of regional climate Change on human health. *Nature*, 438(17):310 – 317.

Richard Hogg,1997. Drought Contingency Planning to Support Pastoralist Livelihoods in Ethiopia. A discussion paper prepared for UNDP-EUE.Addis Ababa.

Roger Blench, 2001. Pastoralism in the new millennium, (Unpublished) issue paper Prepared for FAO, London.

Save the Children-UK, 2006.Livelihood & Vulnerabilities: An Understanding of Livelihoods in Afar Regional State, Ethiopia, Addis Ababa, Ethiopia.

Scoones, Ian. 1994. Living with Uncertainty. New Directions in Pastoral Development in Africa. Intermediate Technology Publications, London.

S.C. Santra. 2001,Environmental Science, New Central Books agency, Calcutta, India.

Taffese Mesfin, What would a Pastoral development strategy constitute? In poverty Reduction and Pastoral Development. Proceeding of the 2nd Annual Conference on Pastoral Development in Ethiopia, May22-23, 2001, Addis Ababa, Ethiopia

Taffese Mesfin, 2001.What should a pastoral development strategy constitute towards Poverty reduction among pastoral communities in Ethiopia. In Proceedings of the Second National conference on poverty reduction strategy and pastoral development. Pastoralist Forum Ethiopia. Addis Ababa.

Tesfahun Fanta Osman Ali, 2003Challenges and Prospects of food security in Ethiopia. In proceedings of food security conference 2003, Professional Associations Joint Secretariat, Addis Ababa, Ethiopia.

Tesfaye Haile. 1988. Causes and characters of drought in Ethiopia. Ethiopian Journal of Agricultural Sciences. Vol.10: 85-97.

UNEP. 2006. New report underlines Africa vulnerability to climate change. Available on http://www.unep.org/Documents.Multyiliongual/Default.asp.

UNEP and UNFCCC. 2002. Climate change information kit. Available at *unfccc.int/essential_background/background_publications_htmlpdf/.*

UN-OCHA, 2007. The Future of Pastoralism in Ethiopia, UN-OCHA Pastoralists Communication Initiatives, Addis Ababa, Ethiopia

Woody Biomass Inventory and strategic Planning Project (WBISPP) 2003, Report on Natural grazing lands and livestock feed resources, Addis Ababa.

Zhou, G., Minakawa, N., Githeko, A.K. and Yan, G. 2004. Association between climate Variability and malaria epidemics in the East African highlands. In *Proceedings of the National Academy of Sciences of the United States of America*, 101, 2375 – 2380.

Annexure I

Interview Schedule for Community Members

General Instructions

- Make sure that the interviewee has well understood the objectives of the interview.

- It is absolutely necessary to win the confidence of the interviewee by creating climate of friendship and trust and asking him/her convenient time, and place to get reliable information.

- Don't make any promise of help and use local unit expression while interviewing.

- Write any additional information you get from interview on your notebook and /or at the bottom of the page of the questionnaire in the language you are comfortable with.

Serial No. of the questionnaire _____

Woreda_____

Kebele _____

Village_____

Specific Site_____

Name of Interviewee _____

Date of Interview_____

. **House Hold Demography**

Code	Age	Sex M/F	Status S/M/D/W	Education level 0 1 2 3	Currently Attending school Yes No

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

Education level

0 = can not read an write 1 = can read and write, but no formal Schooling

2 = primary school 3 = secondary school

2.1. Do you get any extension services from government or NGOs in your locality?

1. Yes (specify)_____ 2. No

2.2. How far do you travel to get to the nearest school in your vicinity? _____ Km

2.3. How far do you travel to get human health services ?_____ km

2.4. How far do you travel to get livestock health service? _____Km

2.5. How far do you travel to get the services of all weather road?_____ km

2.6. How far do you travel to get the services of telephone? _____km

2.7. If you send children to school, why do you send them?

2.8. If you have children (> 5 yrs) not attending school, why don't you send them?

1. No school 2. Far distance to school 3. They will keep animals 4. I don't want 5. Lack of money for fee and other material

6. Other (specify) _____

2.9. If you have children who stopped attending school, what are the reasons?

_____

_____

_____

2.10. What are the major problems of your community both during good and drought years?

1. Lack of drinking water for people

2. Lack of food

3. Lack of pasture

4. Human disease

5. Livestock diseases

6. Lack of livestock market

7. Conflict with other ethnic groups

8. Lack of access road

9. Lack of telephone

10. Others (specify) _____

3. Indicate your occupation across time? (Put tick mark)

S/N	Activities/Occupation	Currently	10 years ago	20 years ago
1	Livestock rearing			
2	Illegal trade (Contraband)			
3	Petty trading			
4	Crop production			

5	Handicraft			
6	Renting pack animal			
7	Other specify			

3.1.If you rear Livestock, indicate the number you have now.

Species	Quantity in No	Remark
Sheep		
Goat		
Cattle		
Camel		
Donkey		

3.2.If you have been engaged on crop production, when did you started and why?

3.3.Indicate the type of crops grown, in order of importance.

Crop grown	Land covered	Remark

3.4.Do you still cultivate crops? Yes ____ No ____ If No why?

3.5. What are the advantages and difficulties of crop production?

Advantages Difficulties

4. On what else income generating activities do you or any members of your family participate?

5. 1. How many times you used to eat per day?

HH members	Currently	10 years ago	20 years ago
Adult male			
Adult female			
Youth			
Children			

Code 01 = once per day 02 = twice per day 03 = three times per day

04 = more than three times a day

5.2. Indicate the types of food you have been eating across time.

(Put tick mark in the appropriate column)

Type of food	Currently	10 years ago	20 years ago
Sorghum			
Rice			
Pasta, Macaroni			
Maize			
Wheat			
Milk			
Meat			

Egg			
Sugar			
Salt			
Oil			
Butter			
CSB			
Vegetables			
Wild fruits			
Blood from slaughtered animals			
Others (specify)			

5.3. What are the reasons for eating only once or twice a day?

Adult male _____

Adult Female _____

Youth _____

Children _____

6. Droughts, Conflict and Mobility (Migration)

6.1.Which was the worst drought period that has highly affected your family and livestock? _____

6.2.What has happened to your livestock during the last drought?

6.3.What has happened to your family during the last drought periods?

6.4.Do you have a permanent living base/village? 1. Yes 2. No

6.4.1. If yes, where. Woreda _____ kebele _____ Village _____

6.5.Have you been migrated during the last drought period? 1. Yes _____2. No ____

6.5.1. If yes, where did you go? _____

6.6. When ever you need to migrate or move your animal in search of feed and water,

A. What is your information source for the location, quantity and quality of feed and water?

B. Who decides when and where to go?

C. Are the information's on feed and water always correct?

Yes ____ No ____

If no which sources of information are mostly wrong?

D. What major problems did you encounter during migration in drought periods?

E. What are the unexpected situations that you face at your destinations?

F. In your opinion, what can be done to improve the information exchange system, so that to have actual and up-to-date information on feed and water availability before livestock movement?

6.7. Do you migrate/move with your livestock during good years (when there is no drought)? 1. Yes ____ 2. No _____

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

1. Shortage of pasture 2. Lack of water for animals 3. Lack of water for people 4. Give time for pasture regeneration. 5. Escape bad weather

6. Other (specify) _____

6.7.2. If no, why?

6.7.3. What are the problems that you face during migration in good years?

6.8. Did you lost animals during the last drought period?

1. Yes _____ 2. No _____

6.9. If yes, indicate the losses.

	Cattle	Camels	Sheep	Goat	Donkey
Number before drought					
Died in the village during drought					
Died during migration					
Died during return to village					
Number after return					

6.10. What were the major causes of livestock death in the drought period?

1. Shortage of water 2. Shortage of feed 3. Disease outbreak

4. Predators 5. All 6. Others, mention _____

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

6.12. What measures have you been taking to tackle livestock disease problems during the last two three decades?

Measures taken	Currently	10 years ago	20 years ago
Use traditional drugs and practices			
Simply purchase drugs from shops			
Contact GO/NGO clinics			
Contact CAHWs			
Others (Specify)			

6.13. Whenever drought occurs which species of animals are most affected? Why? (Circle only two)

1. Sheep 2. Goats 3.Cattle 4. Camels 5. Donkey

6.14. Under good rainfall situation which species of animals do you prefer to keep? And why? (Circle only two) 1. Sheep 2. Goats 3.Cattle 4. Camels

6.14.1. Do you have chickens? 1. Yes 2. No

6.14.2. If no, why? _____

6.15. Do you think that it was possible to prevent or reduce the number of animals you lost during the last drought period? 1. Yes 2. No.

6.15.1. If yes, what were those possible solutions?

7. Please indicate the year in which you posses the least and largest number of animals in your life.

Species	**Maximum**		**Minimum**		**Remark**
	Number	**Year**	**Number**	**Year**	
Sheep					
Goat					
Cattle					
Camel					
Donkey					

7.1.What is the trend of feed availability for different species of animal over years? (Put tick mark on the appropriate column)

Species	Feed Availability			Remark
	Increasing	No Change	Decreasing	
Sheep				
Cattle				
Donkey				
Goat				
Camel				

7.2. Is there any change in your herd structure over years? 1. Yes ____2. No____

7.2.1. If yes indicate the change in the table. (Give 1 for the largest population and 5 for the least population in the herd)

	Sheep	Goat	Cattle	Camel	Donkey
Currently					
10 years ago					
20 years ago					
Possible reasons for change (if any)					

7. 3. Is the change in the herd structure has any effect in your livelihood?

1.Yes ____2. No _____

7.3.1. If yes, what are they _____

9-Do you know the occurrence of drought ahead of time? 1. Yes 2. No

9.1.If yes indicate the time. 1. Before One month 2. Before two months

3. Before three Months 4.Other (specify) _____

9.2.What are the major indicators of drought occurrence?

9.3.Do you made any preparations to reduce the effect of drought, when you come to know its occurrence? 1. Yes _____2. No._____

9.4.1. If no, why?

9.4.2. If yes indicate the activities across time.

No	Preparedness activities	Put × Or ✓ Mark in the Appropriate Column(s) Below			Remark
		Currently	Ten Years Ago	Twenty years Ago	
1	Purchase & Store Grain Before Their Price Rises				
2	Preserve foods (Milk, meat etc)				
3	Selling Most of Your Livestock Before Their Price Falls				
4	Selling Most of The Animals even with Very Low Price assuming that they will die				
5	deworm /vaccinate animals				
6	Borrowing Money From Lenders				
7	Call to relatives for assistance				
8	Renting Labor to save money				
9	Fuel Wood And Charcoal Selling				
10	Informing the situation early to Government For Aid				
11	Praying				
	Others (specify)				

10.Whenever drought occurs what do you do to reduce its effect on your family and livestock?(Put tick mark in the appropriate column)

No	Type of Coping Mechanism Used	Put × Or ✓ Mark in the Appropriate Column(s) Below			Remark
		Currently	Ten Years Ago	Twenty years Ago	
1	Migrating majority of Livestock leaving some for milk				
2	Completely migrating all animals you have				
3	Migration With some family members (Adult male, Young etc				
4	Migrating with the whole family (including, Women, children, elders, etc)				
5	Eating Preserved Food (Milk, meat product etc)				
6	Eating Alternative Foods				
	Roots And Tubers				
	Leaves, Fruits Seeds Etc				
	Live Animals Blood				
	Hunting Wild Animals				
7	Selling Most of The Animals With Very Low				

	Price Before They Died				
8	Eat more meat by slaughtering more animals				
9	Renting Labor				
10	Fuel Wood And Charcoal Selling				
11	Reduce amount of food per meal for adult male				
12	Reduce amount of food for adult female				
13	Reduce amount of food for children				
14	Increase meal frequency for adult male				
15	Increase meal frequency for adult female				
16	Increase meal frequency for children				
17	Wait For Food Aid				
18	Others specify				

10. What are the new activities that you started recently, (but that you didn't previously) due to the effect of recurrent drought?

11. What is the relationship of the price of grain and livestock during different seasons? (Put tick mark in the appropriate column)

Description	**Increases**	**No change**	**Decreases**
Good /Normal season			
Price of grains			
Price of livestock			
Just before the start of drought			
Price of grains			
Price of livestock			
During drought period			
Price of grains			
Price of livestock			
Soon After the end of drought period			
Price of grains			
Price of livestock			

12. Where do you sell your animals?

No	Species	Market Place	Distance in K.M	Remark
1	Sheep			
2	Goat			
3	Cattle			
4	Camel			
5				

12.1. When do you sell most of your animals? Why?

12.2. What are your sources of information for livestock market?

1. Local trader's 2.Govrnment representatives/DAs. 3. Radio

4. Telephone 5.others (specify)_____

13. Soon after the end of the drought period (during good season) do you restock your herd? 1. Yes 2. No

13.1. If Yes How? 1. Purchase animals 2. By gift fro relatives 3. By gift from better off relatives 4. Gift from other local community

6. Gift from GOs or NGOs. 7. Other (specify) _____

14. Have you ever tried to reduce /prevent increase in the number of your livestock?

15. 1. Yes 2. No.

15.1. If Yes why _____

In which season of the year _____

How _____

16. Do you have a local organization through which you assist each other during drought or other disasters? 1. Yes 2. No.

16.1. If yes, what are the major activities performed by these organizations?

16.2. How do you see the relevance of the assistance by community in mitigating the effect of recurrent drought over the past two decades?

16.3.

(Put tick mark in the appropriate column)

Time	Quite relevant/dependable	Somewhat relevant/partially dependable	Not relevant/not dependable
Currently			
10 years ago			
20 years ago			

16.4. If the community assistances are currently not relevant or somewhat relevant, what other option of assistances do you have to mitigate the effect of drought on your livelihood?

17. Indicate the trend of contribution for social obligations.

Activity	Type of contribution	Unit	Amount of contribution across time		
			20 years ago	10 years ago	Currently
Marriage					
Male					
Female					
Religion					
Assistances for the very poor ones					
Others (Specify)					

18.1. Based on your life experience of the past decades, do you think that it is possible to maintain good life by depending only on livestock production? 1. Yes 2. No

a. If No, why? _____

b. If No, which are the other income sources that should supplement livestock production? _____

18.2. What do you want your children do, in the future so that they can lead a better life than what you did? _____

18.3. If you are given with necessary support (Training, Resources etc) will you voluntarily settle in one area and led sedentary life (crop production)?

Yes _____ No _____ Why?

19.1. Which was the month and year in which the last drought occurred?

19.2. During the last drought, what type of assistances did you get from your community? (If any)

19.3. Did you receive any sort of assistance from GO or NGO? 1. Yes 2. No

19.3.1. If yes, who selected the beneficiaries 1. Kebele Officials 2. The community

2. Both 1 & 2 4. No selection was made 5. Other (specify)

19.3.2. In which month did the first ration started? _____

19.3.3. If No why? 1. No aid has been brought to my locality

2. There was but, Not targeted (registered) for the assistances

3. Inaccessibility of the center

4. Because of migration in search of feed and water?
5. Other specify_____

19.3.4. If yes, indicate the type of assistances you get from GO/NGOs.

Type of Assistance	Donor Organization	Duration Of The Assistance Specify The Months Namely	Amount Provided		Specific Distribution center/service delivery point
			Per Person	/House Hold	
Food Items					
Non Food Items					
Human Health					
Livestock Health					
Other Assistances Specify					

19.4. Which were the types of relief assistances or emergency services highly needed but not delivered during the last drought?

19.5. Do all the community members get the relief assistances such as food and non-food items? 1. Yes 2. No.

19.5.1. If not, which community members get the assistances? _____

19.6. Do all the community members get emergency service s such as watering, human & animal treatments and vaccinations? 1. Yes 2. No

19.6.1. If no, which community members didn't get? Why?

19.7. What did you do with the relief assistances you received?

A. Use the whole for family consumption

B. Sell all / partly

C. Exchange for other goods

D. Other specify _____

19.7.1. If you sold the assistances, why?

19.8. Please indicate the relevance of each relief assistance and emergency services delivered during the last drought in the following table.(Put tick mark in the appropriate column)

Type Of Assistance/ Service	Level of Appropriateness			Reasons
	Relevant	Some What Relevant	Not Relevant	
Food Items				
Non Food Items				
Health Services				
Human				
Livestock				

Other Assistances Specify				

19.8.1. Justification for the most relevant assistance_____

19.8.2. Justification for the least relevant assistance_____

20. What were the major problems that you observed during the process of relief food distribution? 1. Exclusion of some poor 2. Inclusion of some better off's 3. Late arrival of ration 4. Late distribution after arrival of ration 5. Incompleteness' of ration 6. Less ration size 7. Far distance to distribution centers 8.mismatch with migration pattern 9. Others (specify) _____

20.1.Have you been satisfied with the emergency service provided during the last drought? (Human treatment, livestock treatment, water supply etc) 1. Yes 2. No

20.2.If no, why? 1. Late start of services 2. Inappropriate sites 3. Short duration.
4. Incomplete services (shortage of drugs, insufficient water etc) 5. Lack of pre-information on the service place and time 6. Mismatch with migration pattern
7. Others (Specify) _____

20.3. During the last drought period what type of relief assistances or emergency services did you get along your migration route?

1. Water for people 2. Food for people 3. Feed for animals

4.vaciination& treatment for livestock 5. Treatment for people 6.non-food items for people 7.transpoartatio for people and livestock 8. Other (specify)_____

20.4. During drought, whenever you migrate across boarder do you get any relief assistance and emergency services? 1. Yes 2. No

20.4.1. If yes, where and by whom _____

20.4.2. If yes, specify them _____

21. Indicate the development activities that are being by GO/NGOs in your area and their relevance in the view of your problems? (Put tick mark in the appropriate column)

No	Type Of Intervention Implementing Organization	Year Started	Quite Relevant	Some What Relevant	Not Relevant	Remark
1						
2						
3						

22. What do you want the government or NGOs do for you and your community?

……..

……..

Annexure II

Questionnaire for Clan leaders

Code ---------- **Date----------**

Interviewer ----------

District/ location----------

Community----------

Brief Description of Community (resources shared, social or ethnic grouping, population, area, etc.)…….

……..

1. (a) Do you know of any indicators of impending drought? [Yes/No]

   (b) If yes, list them in order of importance (from strongest to weakest), indicate approximately

   How long it takes from prediction to the onset of drought and whether this time is adequate for you to prepare for the drought.

Rank	Indicator	Time (days)	Is the time Adequate?
1			
2			
3			

2. (a) Are there specific people in the community who study and pass on information Regarding indicators of impending drought? [Yes, No].

   Specify: ……

   …….

   ……..

   (b) If yes, is this information relayed to neighboring communities? [Yes/No]

   If yes, how? ……

   ……..

   (c) Is the information reliable? [Yes, No]

(d) Are the warning usually headed? [Yes, No]

3. (a) do you prepare to cope with impending drought?[Yes, No]

(b) If yes, how? ----------

(c) Describe what you during the drought in order to cope

---

4. (a) are there any indicators of impending livestock disease epidemics?[Yes, No]

(b) If yes, list them in order of importance (from strongest to weakest)

Rank	Indicator
1	
2	
3	

5. (a) are there specific people in the community who study & pass on information regarding indicators of impending disease epidemics?[Yes/No]

Specify:

_____

(b) If yes, is this information relayed to neighboring communities? [Yes/ No]

If yes, how? ……..

……

(c) Is the information reliable? [Yes/No]

(d) Are the warnings usually headed by the community? [yes/No]

(e) List the livestock diseases that you encounter in order of importance, for each species and the season (drought or flood s) during they are most prevalent.

Rank	Cattle		Sheep		Goats		Camels	
	Disease	Season Drought Or flood	Disease	Season Drought Or flood	Disease	Season Drought Or flood	Disease	Season Drought Or flood
1								
2								
3								

4								
5								
6								

6. (a) do you prepare to cope with impending disease epidemics ?[yes/No]

If yes, how? ----------

(c) Describe what you do in order to cope with disease epidemics

---

---

7. (a) Does the community have grazing reserves? [Ye/No]

(b) If No why? ----------

(c) If yes, list them

1. ---------- 2. ----------

3. ---------- 4. ----------

(f) How are they guarding? ----------

(g) Do you share the grazing reserves with others? [Yes/No]

(h) If yes, what are the negotiating mechanism & criteria used?

(I) D o individual households have their own grazing reserves? [yes/No]

(J) If No why? ----------

(K) If yes what categories of livestock utilize them?

(L) Are there any traditional forage resource management/utilization mechanisms?

Specify

_____

_____

_____

_____

8. Provide the following information about livestock marketing

Name of market place: ----------			**Category * (Primary/secondary/tertiary) Management ***:** ----------		**Market days:** _____ _____
Species	**Average Day Supply**	**Average Daily sales**	**Average Price before drought**	**Average Price during drought**	**Remarks**
Cattle(M)**					
Cattle(F)**					
Sheep(M)					
Sheet(F)					
Goats(M)					
Goats(F)					
Camels(M)					
Camels(F)					
Equine(specify)					
Poultry					
*Select one: primary=Pastoralist to middlemen Secondary=middlemen to merchants					

Tertiary=merchants to slaughter houses/exporters

**M=Male=Female

***Management= Name of regulatory institution /organization

Facility/Service	Adequate	Inadequate	None	Remarks
Holding groups				
Veterinary services				
Dipping Facilities				
Water				
Other				

Marketing Regulations/Policy

9. Impacts of relief aid on livestock marketing

(a) How often have you received relief food during this drought?

[Daily/weekly/Monthly/> 2 months/None]

Food type	Quantity(kg per house hold)	Frequency (Weekly)
Cereals		
Pulses		
Others(specify)		

(b) Have you received any non-food aid? Specify

_____

(c) How often have you sold livestock to cope with family demands during this drought?

Livestock species	Frequency of sales
Cattle: Mature stock	Daily/weekly/Monthly/> 2 months/None
Young stock	Daily/weekly/Monthly/> 2 months/None
Sheep: Mature stock	Daily/weekly/Monthly/> 2 months/None
Young stock	Daily/weekly/Monthly/> 2 months/None
Goats: Mature stock	Daily/weekly/Monthly/> 2 months/None
Young stock	Daily/weekly/Monthly/> 2 months/None
Camels: Mature stock	Daily/weekly/Monthly/> 2 months/None
Young stock	Daily/weekly/Monthly/> 2 months/None
Equine(specify): Mature stock	Daily/weekly/Monthly/> 2 months/None
Young stock	Daily/weekly/Monthly/> 2 months/None
Poultry	Daily/weekly/Monthly/> 2 months/None

(d) Did the relief food received make you not sell or sell less livestock than you would otherwise have sold ?[Yes/No]

10. Effects of crises on major forage species

(a) List the main local forage species & indicate those that disappear during drought and whether they re-appear after drought.

Major forage species	**Disappeared During drought [Yes/No]**	**Re-appeared After drought [Yes/No]**
1.		
2.		
3.		
4.		
5.		

(b) List important forage plants that disappeared during the E1-Nino rains and indicate those that

Re-appeared after the rains. Also list important forage species that gained dominance after the rains.

Important forage species that Disappeared during E1-Nino rains	**Re-appeared After the rains? [Yes/No]**	**important forage species that gained dominance after E1-Nino rains**
1.		1.
2.		2.
3.		3.
4.		4.
5.		5.

11. Wild life/Livestock interaction

(a) Does the community utilize any game parks/reserves, forests or ranches for emergency grazing during drought? [Yes/No]

(b) If yes, List them

1. …….

2……

3. …….

(b) Does the community have problems with wildlife? [Yes/No]

(c) If yes, list the wildlife species and indicate the problem s encountered

Wildlife species	problem s encountered
1.	
2.	
3.	
4.	

(d) How much forage do the wildlife animals graze?

[More than your livestock /the same as your livestock/Less than your livestock]

(e) Do wildlife utilize the same water sources as livestock? [Yes/No]

12. Migration patterns

(a) Does the community move livestock to other places in search of pasture and water drought? [Yes/No]

(b) If yes, where do they move to and how far away is it?

1._____km……

2. _____ km……

3. _____km…….

(c) Describe the route they take

1. …….

2……

3……

(d) What determines the route they take?

1……..

2……..

3. ……

(e) What problems is encountered en-route?

1……

2……

3……

13. Mitigation management

(a) Who makes the decision to move livestock?.....

(b) Who goes with the livestock?.....

(c) Who remains behind? ……..

(d) What do those remaining behind do in order to cope?

…….

……..

(e) What categories of livestock are moved?

……..

……

……

(f) What categories of livestock are left behind and why?

……..

……

(g) How are the animals moved? [E.g. trekked, trucked……..

(h) What role do women play during migration? ……

(i) How are the livestock managed en-route (breeding, milking, treatment, new-born, aged, Security, etc)

……

……

……

……

(j) List the livestock diseases that you encounter during migration in order of importance, for each Species.

Rank	Cattle disease	Sheep Disease	Goat disease	Camel disease
1				
2				
3				

Annexure III

QUESTIONAIRE FOR WOREDA EXPERT

Dear Sir/ Madam,

I am conducting a study on 'ADAPTIVE STRATEGIES OF PASTORALISTS TO CLIMATE CHANGE IN AYSAITA AND AFAMBO WOREDA OF AWSA ZONE, AFAR NATIONAL REGIONAL STATE' In this context, I request you to kindly fill up this questionnaire and return to me at your earliest. I assure you that the information given by you will be kept confidential and will be used only to prepare my dissertation which is a part my dissertation for M.A. in Rural Development of Indira Gandhi National Open University.

Yours sincerely

Aydahis Afkea

1-Name ……

2-Occupation……...

3-How long have you been working in this organization? (Tick (√) Relevant)

a, Less than 2 years

b, 2-5 years

c, Above 5 years

4-What is your educational Background? (Tick (√) Relevant)

a, High school certificate

b, College Diploma

c, Bachelor Degree

d, Masters and Above

5- What are the major livelihoods of the people in the region? (Tick (√) Relevant)

a, Pastoralism

b, Agro-Pastoralism

c, Trade

d, Salt mining

6- What are the main activities in your tasks?

……..

…….

……

……

……

……

7- What are the challenges faced during your work?

……

……

……

……

……

……

8- What are the main potentials of the woreda for development?

……..

……..

……..

……..

……..

……..

……..

9-What are the attitudes of the community members to development?

……

……

……

……

……

10- What are the causes of drought and livestock diseases in your woreda?

……

……

……