

*Addis Ababa
University
(Since 1950)*



ADDIS ABABA UNIVERSITY
SCHOOL OF GRADUATE STUDIES

**The Impact of Drought on Livelihoods, Vulnerability and Coping Mechanisms:
the Case of North Shoa Zone, Oromiya**

**By
Defferew Kebebe**

**Advisor
Mulugeta Abebe(PhD)**

**A Thesis Submitted To the School Of Graduate Studies of Addis Ababa
University in Partial Fulfillment for the Masters in Public Administration and
Management**

**Addis Ababa, Ethiopia
March, 2011**

Addis Ababa University

School of graduate studies

**The Impact of Drought on Livelihood, Vulnerability and Coping Mechanisms.
The case of North Shoa zone, Oromiya Region**

By
Defferew Kebebe

Public Administration and Management

Approved by Board of Examiners

Mulugeta Abebe (PhD)

Advisor

Signature

Date

Examiner

Signature

Date

Acknowledgments

It is my pleasure to express my deepest gratitude, respect and appreciation to Mulugeta Abebe (PhD), my advisor for his patience, understanding and constructive advice throughout the development of this paper.

My heartfelt thanks also goes to Ayelew, teacher at Dera woredas for his facilitating on how to approach and get information from the society, Deressa Aba Gidi, DA at Degam Woreda, officials who are founding at different place for their cooperation in providing data and information.

Special note of appreciation also is extended to all my beloved friends for their encouragement for the finalization of this paper.

Finally, I thank all the sources (both primary and secondary) that support me for success of this paper.

Table of contents	Page
Acknowledgments.....	i
Table of contents.....	ii
Abstract.....	v
List of Tables	vi
List of figures.....	vii
Acronyms.....	viii
Chapter One.....	1
1. Introduction	1
1.1. Background of the study.....	1
1.2. Statement of the Problem.....	4
1.3. Research Questions.....	5
1.4. Objectives of the study.....	5
1.5. Research Methodology	6
1.5.1. Theoretical Frmework.....	6
1.5.2. Research Approach.....	8
1.5.3. Sources of Data and Data Gathering Instruments.....	8
1.5.3. Methods of Data Analysis.....	12
1.5.4. Sampling Design.....	12
1.6. Study Area	13
1.7. Scope of the study.....	14
1.8. Significance of the study.....	14
1.9. Limitation of the Study	15
1.10. Structure of the study	15
Chapter Two	16
2. Conceptual Framework and Review of Literature	16
2.1.Introduction.....	16
2.2. Definitions and Concepts of Drought	16
2.3. Impacts of Drought	19
2.3.1. Impacts of Drought on Agrarian livelihoods and Societies	21
2.3.1.1 Impacts of Drought on Agriculture	22

2.3.2.2 Social Impacts of Drought	23
2.4. Vulnerability	24
2.4.1. The concepts of vulnerability: Definitions and Issues	24
2.4.2. Approaches of vulnerability.....	25
2.4.2.1 Socio-economic Approach	26
2.4.2.2 Biophysical Approach	26
2.4.2.3 The Integrated Assessment Approach	27
2.4.3. Methods for Measuring Vulnerability to Drought Impacts	28
2.4.3.1 Econometric Method	28
2.4.3.2 Indicator Method	29
2.4.4. Determining factors of vulnerability to drought impacts.....	30
2.3.4.1 Social vulnerability factors	30
2.3.4.2 Biophysical vulnerability factors	33
2.5. Drought management and Adaptation Strategy.....	34
2.5.1. Drought management strategy	34
2.5.2. Adaptations/Coping Mechanisms to Drought Impacts.....	38
2.5.2.1 Definitions and Issues	38
2.5.2.2 Local adaptation/coping mechanisms to the impacts of drought	40
2.6. Adaptation and Sustainable Development	43
2.7. Conclusion-----	45

Chapter Three

3. Data Analysis, Presentation and Discussion	46
3.1. Introduction-----	46
3.2. Profiles of the Interviewed Respondents	46
3.3. Trends of Drought in North Shoa zone.....	47
3.4. Impacts of Drought on Livelihoods and the Society	50
3.4.1. Impacts of Drought on Crop Cultivation and Livestock Rearing	51
3.4.2. Impacts on the society.....	54
3.5. Who is more vulnerable to the impacts of drought and why?	56
3.6. Major challenges exacerbating vulnerability	59
3.7. Adaptation/ coping mechanisms	61
1.7.1. Local adaptation strategies to Drought	61

3.7.2. Institutional response strategies provided in the zone	63
3.8. General Discussion	65
3.9. Conclusions.....	70
Chapter four.....	71
4. Summary of the Findings, Conclusions and Recommendations	71
4.1. Summary of the Findings	71
4.1. Conclusions	72
4.2. Recommendations	73
References	75
Appendix-I.....	79
Appendix-II	83

Abstract

Agriculture is one of the sectors most vulnerable to drought impact. The impact is even stronger in Africa, where agriculture is truly important for the daily subsistence, and where adaptive capacity is low. Therefore, it is crucial to increase the understandings of the concerned body and local community in the continent in general and in Ethiopia for future most likely drought impacts. This study uses the North Shoa Zone in Ethiopia, as a case study and examines the trends of drought and its impact on livelihood in the region. It also answers the questions who is more vulnerable and why, what are the local and institutional coping strategies and what are the constraints that aggravate vulnerability. The study uses personal observation, structured and semi-structured interview to gather information from local people, government officials and experts, and secondary data from published and unpublished sources, and systematically analyzes this material both using qualitative and quantitative analysis. The result shows that drought increases from time to time in the zone even if there is variation between and among years and it challenges the livelihood of the whole region. To cope up with the impacts, societies use savings, migration, credits, selling own assets (who own asset) and on-farm and off-farm diversification as strategy. The coping mechanisms provided by institutions is very weak and at its early stage in the zone. And the coping mechanisms available in the zone are not equally important and practiced and are insufficient to cope with drought impacts. Thought all households in the zone are vulnerable to the disaster, the problem is more acute on the poor, women, large size family, children, old and disabled. Vulnerability is further aggravated by the decline in the fertility of land, landlessness, unemployment, unavailability and inability of most farmers to afford agricultural inputs, fertilizer and selected variety of crop. The study suggests a relentless need to address these challenges both from short and long-term policy perspective.

List of Tables

Table 1: Focus group discussion participants, type and composition in selected areas-----	11
Table 2: Result showing the percentage demographic features of the interviewed respondents -----	46
Table 3: Interview result showing the percentages of Educational Statues of the respondents-----	47
Table 4: Land planned to be cultivated but left uncultivated due to delay of rain in the sample woredas (2005-2008)-----	51
Table 5: Expected crop yields and net achievement caused due to shortage/absence of rain before and after the production in the sample woreda(2005-2008)-----	52
Table 6: Interview results showing the percentage of social groups' vunerable to drought-----	56
Table 7: Interview result showing the percentage of major adaptation strategies used in North Shoa zone-----	61

List of figures

Figure 1: Socio-economic and Environmental Impacts; Drought processes, factors, relationships and impacts-----	18
Figure 2: Showing the Trends of Rainfall and Temperature for Fitcha, G/Guracha and Gundo Meskel, North Shoa Zone-----	48
Figure: 3 Diagram showing trends of crop yield verses land cultivated in North Shoa zone (2000/2001-2007/2008) -----	53

Acronyms

ARDO – Agriculture and Rural Development Office

BBMT –Broad Bed Maker Technology

BOFED -Bureau of Finance and Economic Development

CSA – Central Statistic Agency, Ethiopia

DAs – Development Agents

DPPO – Disaster Prevention and Preparedness office

FAO - Food and Agricultural Organization

FDRE – Federal Democratic Republic of Ethiopia

FFW - Food for Work

MOFED -Ministry of Finance and Economic Development

NMSA – National Meteorological Service Agency, Ethiopia

PSNP -Productive Safety Net Program

IPCC – Intergovernmental Panel on Climate Change

UNDP- United Nations Development Program

WB -World Bank

WCDP-World Conference on Disaster Prevention

WFP -World Food Program

WHH-Women Headed Household

Chapter One

1. Introduction

1.1. Background of the study

Now a days, most African countries are dealing with a number of socio-economic and environmental challenges including poverty eradication, minimizing resource degradation, controlling rapid population growth, and improving low agricultural productivity. Particularly, the continent is regularly affected by severe and often multi-years of drought. However, all areas within Africa are not equally vulnerable to drought. The sub-Saharan part of the region is considered to be the most drought-prone. This region is relatively drier, receiving much lower rainfall compared with the rest of the region (Sara, 2009).

Ethiopia is one of the sub-Sahara African countries highly prone to hazards. Different hazards have been recorded in Ethiopia. However, drought has remained the leading cause of disaster and human suffering in Ethiopia in terms of frequency, area coverage and the number of people affected. The history of drought in Ethiopia goes back to 250 BC and there had been many national and localized droughts even before that of the 1970s for which international support was sought for the first time, which were managed mainly by communities ' own coping mechanisms. However, the magnitude, frequency and the effects of the droughts have increased since mid 70s. The severity and persistence of the latest droughts has produced a wide range of impacts across the country (Ibid).

Though agriculture was taken as a core sector to solve the current challenges and to bring future sustainability to the continent, the sector is recently challenged by climatic shocks such as prolonged drought, late coming and early stop of rainfall before and after crop maturity. Agricultural production has been severely affected and there has been a significant reduction in livestock populations that are the mainstay of subsistence livelihoods. Large population movements due to drought have aggravated and compounded these miseries for communities, often with disproportionate impacts across the country (McCarthy, 2001; Collier et al., 2008; Ngaira, 2007; Adger et al., 2003).

The droughts of the last decades in Ethiopia have produced a complex web of impacts, which spans many sectors of the economy, especially the agricultural sector where it is the largest sector of the economy. Like many other developing countries, agriculture (with the largest number of livestock in Africa) is the single largest livelihood of an overwhelming majority, 85 percent of the population (CSA2, 2008). It also provides a major share of the economic activity, accounts for 52 percent the GDP, 60 percent of the exports, and 80 percent of the country's labour force (MEDaC, 1999; UNDP, 2002, cited in Deressa T., et al, 2008). In addition, as agriculture is the backbone of the country, it is expected to play a key role in generating surplus capital to speed up the overall socio-economic development of the country (CSA2, 2008). It is also the major source of food for the population and hence the prime contributing sector to food security. However; the contribution of agricultural sector to the total economy is challenged by its vulnerability to prolonged drought and shortage of rains.

The level of vulnerability of Ethiopian agriculture to drought is determined by both socio-economic and biophysical factors. The socio-economic factors most cited in the literature include the level of technological development, infrastructure, institutions, and political set ups (Deressa, et al, 2008) and the biophysical attributes mainly include climatic conditions, quality of soil, and availability of water for irrigation (Ibid). Although the name "Water Tower of Africa" has been given to Ethiopia, agriculture is largely dependent on the timely onset, amount, duration, and distribution of rainfall. Over 90 percent of the food supply comes from rain-fed subsistent agriculture and rainfall failure means loss of major livelihood source that always bring out food deficit (Adgolign, 2006). The use of both irrigation and water harvesting technology has a long way to go to bring the desired development. According to the survey of CSA (2008) Farm Management Practices, the total irrigated crop area was estimated to 179.8 thousand hectares (about 1.5 percent of the total crop land) (CSA4, 2008). This lag is attributed to the unsuitability of the topography for irrigation, uneven distribution of water resources and lack of technology.

In the past decades, the growth rate of agriculture sector in Ethiopia has lingered behind the rate of population growth; and as a result, to support the demand of its population, the country has become one of the net importers of agricultural products and lined along with the major food aid recipients in Africa. Between 1980 and 1997, for instance, the annual population growth was around 3 percent per annum, whereas cereal crop production grew at a rate of only 0.9 percent per annum, indicating the declining food per capita, increasing food insecurity and worsening poverty (Bewket, 2003). Between 1994 and 2007, the population grew at an annual average rate of 2.6 percent, and projected to around 120 million by the year 2025 (Goldstone, 2007). Owing the above-mentioned facts and the high sensitivity of Ethiopian agro-ecosystem to rainfall (Fraser, 2007) and low adaptive capacity to respond to damages, even a week delay of rains have a large impact on crop yield and on the overall socio-economic activity of the country.

Rainfall decreases ‘significantly’ in June-July-August (JJA) over the eastern parts of Africa which is the main crop cultivation season in Ethiopia (Hulme, et al., 2008, cited in Deressa, 2007). However, it was acknowledged that the level of information and knowledge on drought impacts in several sectors of East Africa is exceedingly unreliable, generally poor to moderate only (Thornton et.al, 2006). In particular, there has been little discussion combining both drought impact on agriculture and subsistent agricultural systems (Morton, 2007).

In Ethiopia, many researchers have conducted an integrated quantitative vulnerability assessment in different part of the country especially in areas which are historically said to be drought prone by using biophysical and social vulnerability indices of Ricardian approach and the study has found that drought has been damaging to Ethiopian agriculture. The attention of most researchers till now is towards areas that are historically said to be drought-prone. But, currently there are many areas of the world that are highly affected by recurrent drought. Such areas have been ignored by the concerned bodies due to the absence of adequate data. The researcher has acknowledged as their study was highly aggregated and further study is needed in areas, which are not

historically known to be drought prone areas and little attention is given by government but, repeatedly affected by drought, one of a gap this study is aimed at filling.

1.2. Statement of the Problem

Agriculture is one of the most vulnerable sectors to drought impact. The impact is even stronger in Africa in general and in Ethiopia in particular, where agriculture is truly important for the daily subsistence, and where adaptive capacity is low. Lack of technology, weak institutions and the like makes the continent to be easily vulnerable to the impacts of drought.

To reduce the society's vulnerability to drought, the government of Ethiopia has undertaken different measures to minimize the effects of drought on society's livelihoods in areas, which are commonly said to be drought prone areas even if the degree of intervention or assistance varies. However, currently there are many areas of the country, which are highly, affected by drought other than areas, which are historically said to be drought-prone areas. Little attention is given by government and other non-government organizations for such areas despite they have been repeatedly affected by drought. Because the level of information/data and knowledge on such areas' vulnerability to drought impact is very low and the attention of most researcher is towards drought-prone areas.

Inline with this, North Shoa Zone is among one of the zones, in Oromiya Region, that has been affected by prolonged drought, delay in onset of rain, erratic and low precipitations for a long period of time. Drought has been repeatedly and highly damaging the zone's agricultural productivity and other livelihood every year even if its impact varies from year to year. However, there is low intervention of government and other aid agencies in the zone while the zone has been repeatedly affected by drought due to lack of data or less understanding or knowledge regarding to the zone's vulnerability to drought and no one undertake research before on the susceptibility of the zone to drought impacts. Thus, the ambition/aim of this study is to assess the actual impacts of drought and expose it to policy maker, and increase its understanding and enhance the society's local/indigenous coping mechanism in the study areas.

1.3. Research Questions

The study provides answer to the following critical research questions:

1. What are the trends of drought and its major impacts experienced in North Shoa Zone?
2. How it affects the community's livelihood?
3. Which section of the societies are mostly vulnerable to the events and why?
4. What are the constraints that aggravate (exacerbate) vulnerability?
5. What are local and institutional adaptation/coping strategies in the zone and how they can be viewed from sustainability point of view?

1.4. Objectives of the study

The general objective of the study is to assess and increase the understanding of the present impacts of drought, vulnerability and coping mechanisms at the household, community and district level and demonstrate its implication for the future most likely drought impacts in the North Shoa Zone.

The specific objectives of the study are:

1. To assess some of the trends of drought and its major impacts in the Zone on farmers' livelihood (especially on crop cultivation and livestock rearing)and consequently on society at large,
2. To identify section of the society mostly vulnerable to drought impacts and the reason behind it,
3. To know constraints that aggravate vulnerability in the zone,
4. To identify local (indigenous) and institutional adaptation/coping mechanism and
5. To forward policy and action areas to be enhanced in order to increase the understandings of the concerned body and local community in the zone for future most likely drought impacts.

1.5. Research Methodology

1.5.1. Theoretical Framework

The study of the impact of drought on the livelihoods of local populations is increasingly forwarded as an urgent research needs (Morton, 2007; Smit & Pilifosova, 2003). A multitude of approaches and methodologies are used for this purpose. The following concepts are continuously re-occurring in the methodological and theoretical framework of this study. Therefore, the researcher will in this first section clarify these concepts.

Impact Assessment

Depending on the discipline, literatures use different terms and definitions for the term impact. Some of the terms include hazard, risk, biophysical vulnerability or generally vulnerability (Brooks, 2003, cited in Deressa, 2008). To limit the scope of the study to climatic shocks especially drought impact on livelihood and society, the definition of biophysical vulnerability by Deressa et al., (2008), which refers to the extent of damage inflicted by drought on livelihood and social systems, is used in this study. The impact of drought on livelihood (livestock tending and crop cultivation), and consequently on the society is analyzed based on local available data, impacts, vulnerability and coping strategies by employing qualitative study or using appropriate themes or indicators selected from previous literatures e.g., J. Pulhin et al. (2006), such as livestock status, crop production, people affected by the impact, deaths, malnutrition cases, food and seed shortage, income shortage, production costs or ecosystem damage.

Vulnerability Assessment

An impact study is most helpful when focusing on a single stressor, in this case drought (Nkem et al., 2007, cited in Abate, 2009). Thus, impact alone is subtle and may not be sufficient to show the consequences of drought impact on different members of the same or different community (McCarthy, 2001). Thus, to evaluate drought impact in the context of multiple stressors that reduce adaptive capacity, many of which are not related to drought; vulnerability assessment is most helpful (Desanker & Justice, 2001). Vulnerability assessment also ‘‘helps to informs decision makers to facilitates decision-making process of specific stakeholders of a sector about their options for adapting to the

effects of drought within the scope of their resources’’ (Nkem et al., 2007, cited in Abate, 2009).

Vulnerability in this study is, thus, defined as the likelihood of households and communities in North Shoa Zone, Ethiopia, to suffer from drought impacts on their livelihood and their inability to respond to stresses resulting from the impacts. This definition is also in agreement with the definition of IPCC and WCDP, where it defines vulnerability as ‘the degree to which a system is susceptible to, or unable to cope with, effects of drought (WCDP, 2004; IPCC, 2007b and IPCC, 2001). To assess vulnerability of rural livelihood strategy in context of shocks and other stressors Ellis (2000), used indicators such as asset (market, land holding, water availability, biological resources, social interconnectedness, labor or human capita, saving and credit availability) and asset access modification by social relations, institutions and organizations. Thornton et al., (2006) also used several natural capita, physical capita, human capita, financial capita and social capita to analyze vulnerability. As this study is more of descriptive, the selection of indicators or themes (or sub-indicators and sub-themes) is based on the analysis of responses from local society and previous vulnerabilities, how and why they are vulnerable.

Coping mechanisms to Impacts of Drought

Societies are dynamic and they use all possible strategies to reduce the vulnerability to drought impacts. There are two kinds of responses to crisis that overlaps across the temporal scale, coping mechanisms and adaptive capacity. Coping mechanisms are the actual/immediate responses to crisis on livelihood systems in the face of unwelcome situations, and are considered as short-term responses (Berkes & Jolly, 2001). Adaptive strategies are the strategies in which a region or a sector responds to changes in their livelihood through either autonomous or planned adaptation (ibid; Campbell, 2008). Coping mechanisms may develop into adaptive strategies through times (Berkes & Jolly, 2001). However, it is difficult to make a clear distinction between coping mechanisms and adaptations. This study considers both schemes as coping strategies (ibid.). The resilience or the robustness of coping mechanisms differ depending on the availability

and access to resources and technology (Adger et al., 2003). In this study, both local and institutional coping strategies are assessed from the collected information.

1.5.2. Research Approach

The aim of this research is to undertake an intensive examination of impacts of drought, vulnerability and coping strategies in association with societies with in specific location, descriptive research method is used. In descriptive research method, descriptive questions such as “what”, “how and when” most are appropriate and help to harness the detailed and valuable insights and understandings of the topic under study. It also is believed that employing both quantitative and qualitative approach is more useful to understand the complex factor that make households vulnerable and their strategies which requires a detail understandings of everyday lives and processes involved. Employing both quantitative and qualitative approach helps to assess the impacts of intervention mechanisms on the lives of the poor. To this end, the study employed more of qualitative and some of the quantitative research approaches. Methodological triangulation; obtaining data from different sources, such as observations, documentations and interviews, helps to harnesses diverse ideas about the same issue and assist in cross-checking the results, and consequently helps to increase the validity, reliability of the findings and eases data analysis.

1.5.3. Sources of Data and Data Gathering Instruments

To undertake this research, both primary and secondary data were utilized. Primary data were obtained from field observation, focused group discussion, and structured and semi-structured interviews with government officials, households and local administrative and key informants. And secondary data were collected from government documents, meteorological data, crop production data and livestock data.

Interview

Interview held with local household were used to gather information regarding to socio-economic status (land size, livestock number, literacy, sex, gender and age), drought

trends, drought impact on the livelihood and the society, coping mechanisms, vulnerability and factors aggravating vulnerability. The interview was conducted on 33 households, 10, 10, 13 households from lowlands, mid, and from highlands respectively. Since the objective of the study is to get a more comprehensive overview about the study, households were tracked using the data from the kebeles and were selected based on convenience. To enhance the chance of meeting the households in their village, early morning and late afternoon time was found to be an appropriate time.

Based on the language know-how of the respondent, Afan Oromo the most spoken languages in the zone, was used for interview and later translated to English. The interview took place face-to-face and sound recorder was used in order to minimize information loss. In cases of lack of consent from interviewee or distractions “interview protocol, a form ...with questions and ample space between the questions to write the responses” was used. To get as much information as possible the respondents were treated as a “carriers of information” while the researcher was acting as an “ignorant knower”, but he was curious enough while the information flows from the interviewee. The interview took an average of 25 to 30 minutes each.

However, there are cases where households refused to be interviewed because of ‘political fear’ that was mainly emerged from their inability to read the letter of cooperation written to them. There were also cases when some of the respondents provide false data (especially local administrative). It was especially challenging to ask details that come at first (names, assets, children, age). Then the researcher decided to move these details to the end of his questionnaire, and he also tried to convince them the study’s neutrality from any politics. Since he know the languages and the tradition, to get the accessibility of information he also used informal communication as a beginning and acted like ‘a non-stranger’ to the area. Since the questions revolve around livelihood of households, it was also another challenge to make the interviewees focus on the questions in the questionnaire. There were particularly two topics that the interviewees wanted to discuss. Some expected more aid and others had complaints regarding humanitarian aid, corruption cases and lack of aid after facing sever drought during previous years.

However, to focus on his research questions, the researcher tried to make clear that even if he could not help them practically now, the result of the study will hopefully contribute to the scientific and socio-economic knowledge that may help for the future sustainable alleviation of the problem.

Interviews with government officials such as Zonal and Districts agricultural and rural development office(ARDO) directors, Livestock experts and Agronomists from the zone, Zonal Development Agents and Zonal disaster prevention and preparedness office (DPPO), food security office director also be used to elicit data regarding to drought trends, impacts, vulnerabilities and the existing stressors.

Semi-structured interview

Semi-structured interview was also used to ask questions which were not included in the structured interview in case new questions raised as ideas emerge through the process.

Focused group discussion

Focused group discussion were held in study communities to harness information regarding to the trends of drought in the zone, adaptation strategies they use before and after the shocks and to know the institutional response strategy provided for them before and after the crisis. Accordingly, three focused group discussion, each consisted of 6-7 members were conducted. The participants were individuals who represent different wealth groups, elders and female headed households (to maintain gender balance) within various kebeles and they freely (willingly) expressed their ideas, perceptions and experiences regarding the issues understudy.

Table 1: Focus group discussion participants, type and composition in selected areas

Selected areas	No. of FGD by wealth, Elders and women household group			
	Different wealth groups	Elders	WHH	Total
Highland	4	2	1	7
Midland	5	1	1	7
Lowland	3	1	2	6
Total	12	4	4	20

Key informants interview (officials from different offices)

Key informant were government officials who are found at different level of government (zonal and woredas). The interviews and discussion with informants found to be more valuable in providing context at general level, and gave the researcher a wealth of knowledge about the community and an in-depth understanding of the major impacts of drought on livelihoods, coping mechanisms and generally the socio-economic realities of households.

Field observation

Data regarding to the current socio-economic challenges (resource endowments) and existing coping strategies will be gathered through field observation.

Document analysis

As mentioned before, secondary data were gathered from relevant offices. For instance, relevant documents and harvest data was elicited from district and zonal ARDO. And data for affected people was collected from DPPO. Data related to temperature and precipitation was collected from national metrological service agencies (NMSA).

1.5.4. Methods of Data Analysis

The data gathered were analyzed in terms of the study objectives already designed. The process of analysis was carried-out by using qualitative and quantitative descriptions and descriptive statistical tools such as percentages, tables, graphs, diagrams and etc. were utilized to analyze data. Computer systems such as Microsoft excel and Microsoft word that used for analysis was also utilized.

1.5.5. Sampling Design

Oromiya is a vast region comprising about 19 zones. As it is not viable and economical for the researcher to survey all the zones, North Shoa Zone is purposely selected from the region. Some of the general specifications taken into account for the selection of this study area can be mentioned as follows; first, the study areas has been affected by drought in most case but, yet, less attention was given by government and other non-government organizations. Most people in the zones are either seasonally or chronically food insecure due to recurrent drought. Second, although most people are food insecure and the zone is repeatedly affected by drought, there is no researcher who has conducted a research before regarding to drought impacts in the zone. Third, as the researcher grew up in the region, there was no communication barrier between the local people and the researcher to interact and deal with all matters related to the research activities.

Here also, it is not feasible to collect data from all the woredas in the zone. Therefore, for primary data collection, three woredas (believed to be representative in reflecting the character of the remaining parts of the zone) was purposively selected in consultation with the zonal agricultural and rural development office based on ideal representativeness of the other woredas and their geographical location. Accordingly, Degam Woreda from highland (Degam), Kuyu Woreda from mid-land (weinadega) and Dera Woreda from lowland (kola) were selected as a sample.

From each Woredas, kebeles were selected by using simple random sampling. Further, to select household respondents from the selected kebeles, non-probabilistic convenience sampling method was used. The selection of sample at different stages can be summarized as follows:

Oromia national regional state

Purposively selected

(Size, previous attention by researcher,
Easily accessibility)

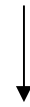
Three woredas' purposively selected from the zone

(Based on ideal representativeness and geographical location)

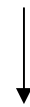
kebeles were selected from each woredas using simple random sampling

Selection of household respondent's from Each Kebeles' based on convenience

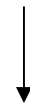
North shoa zone



Three 'woreda's'



six kebeles'



33 households

1.6. Study Area

The study is conducted in North Shoa zone, one of the 19 zones of Oromiya Regional State located in central part of Ethiopia, where mixed farming have been commonly practiced in highlands, mid and lowlands. The capital town of the zone is Fitcha, which is around 110km far from Addis Ababa. The zone has an estimated land area of about 11,376.32 square kilometers and is sub divided into 17 Woredas (districts), namely, Barahi, Barak, Aleltu, Degam, Dera, Gerar Jarso, Hidabu Abote, Kembibet, Kuyu, Mulona, Sululta, Wara Jarso, Wuchalena, Jidda, Yaya Gulale, Debre Libos and Abichu Nya'a.

Livelihood strategies and classification

Like most part of Ethiopia, mixed farming dominates the livelihood of the zone. Land is an important asset of households for production of crops and rearing of livestock. The most commonly produced crops in the zone are annual crops such as barley, wheat, teff, maize. Livestock serves as a source of manure and fuel, pay land tax, fertilizers and as a saving to buffer bleak seasons of food/seed shortage. Oxen are the major ploughing engines. Donkeys, horses and mules play a significant role in transportation of people,

water, and goods. Due to the high complexity and strong inter-linkage between crop production and livestock tending, it is difficult to consider the two livelihoods separately (Aune et al. 2006).

The interlink ages are related to manure production, traction power, fodder production, and income generation. This makes it impossible to change one component without affecting the others (ibid.).

The wealth classification criteria for some districts were not clearly set. But, as in all other rural parts of Ethiopia, livestock ownership and land holding are the two most important criteria for ones wealth and status measure in the society. However, the agricultural production is predominantly subsistent and it is difficult to estimate the household yearly income. Nevertheless, it is clear that most of the produced crops and livestock or livestock products are used for household consumption. The remaining used for seed and sold to pay credits, government obligations, purchase of fertilizer, household financial expenses and others (CSA3, 2008).

1.7. Scope of the study

The impact of drought is diverse and different from one place to another place. But, this study is limited to the impacts of droughts on livelihood of farmers especially on crop cultivation and livestock rearing and consequently on the society. It also uncovers section of society that were more vulnerable to drought impacts and the major coping strategies they use in time of drought. Geographically, this study is confined to North Shoa Zone only, due to time and financial constraints

1.8. Significance of the study

Even though the study focuses on North Shoa Zone in Ethiopia, the result of this study is relevant to many areas of the country as well as other countries that are affected by recurrent drought but forgotten by the government and other aid agencies due unavailability of data (information) .

1.9. Limitations of the Study are listed below;

1. The most and first challenges of the study is shortage of time.
2. Lack of sufficient resources necessary to accomplish the project.
3. Perception of different wealth groups in providing information; better-offs are very suspicious in providing the sources of income and asset owned while poor expects assistance from the researcher and the general fear of losing the expected organizational relief and development support(in place where it is available).
4. Difficulty to estimate household's annual income in terms of cash.
5. Unavailability of sufficient data in the office due to poor record and documentation and change of employees from time to time.

1.10. Structure of the study

The study is divided into four chapters. The first chapter is introductory part which discusses background, statement of the problem, research questions, objectives, methodologies, significance, scope, limitations, and structure of the study. The second chapter deals with literature review and the third chapter focuses on data presentation, analysis and discussions. The final chapter is about the summary of the findings, conclusions and recommendations.

Chapter Two

2. Conceptual Framework and Review of Literature

2.1. Introduction

To make proper assessment of any subject matter, it is crucial to have a look at a conceptual aspect and previous related literature of the study. As such this chapter reflects on the conceptual framework and related literature of the subject matter-drought impacts, vulnerability and coping mechanisms. First, the basic concepts of drought and its socio-economic impacts are described. Then the concepts of vulnerability, its factors and methods of measuring vulnerability are discussed. Finally, various adaptation/coping mechanisms are described.

2.2. Definitions and Concepts of Drought

Drought occurs in virtually all climatic zones, but its characteristics vary significantly from one region to another and its definition varies from region to region and may depend upon the dominating perception, and the task for which it is defined. It originates from a deficiency of precipitation over an extended period of time, usually a season or more. It should generally be defined relative to some long-term average condition in a particular area, a condition often perceived as “normal” (Verdin, 2007). It is also related to the timing (i.e., principal season of occurrence, delays in the start of the rainy season, occurrence of rains in relation to principal crop growth stages) and the effectiveness (i.e., rainfall intensity, number of rainfall events) of the rains. Other climatic factors such as high temperature, high wind, and low relative humidity are often associated with it in many regions of the world and can significantly aggravate its severity. Drought is a temporary deviation; it differs from aridity, which is restricted to low rainfall regions and is a permanent feature of climate (Sara, 2009).

US National Drought Mitigation Centre (2003) differentiates between conceptual and operational definitions of drought. Conceptual definitions are normally formulated in general terms, do not provide quantitative answers to “when”, “how long” or “how severe” a drought is and are often used as a start-up in scientific papers and reports to

help people understand the concept of drought. Operational definitions identify the beginning, end, spatial extent and severity of a drought. They are often region specific and are based on scientific reasoning, which follows the analysis of certain amounts of hydro-meteorological information. They are beneficial in developing drought policies, monitoring systems, mitigation strategies and preparedness plans. Operational definitions are formulated in terms of drought indices. The severity of a drought can be measured climatically, socially, and economically (Ibid).

Another classification, based on a disciplinary perspective, can be found in Dracup et al. (1980), where droughts are related to precipitation (meteorological), stream flow (hydrological), soil moisture (agricultural) or any combination of the three.

i. Meteorological Drought

Meteorological drought is defined usually on the basis of the degree of dryness (in comparison to some “normal” or average amount) and the duration of the dry period. It is based on solely on departures of rainfall from expected amounts. So, the definition of meteorological drought must be considered as region specific since the atmospheric conditions that result in deficiencies of precipitation are highly variable from region to region.

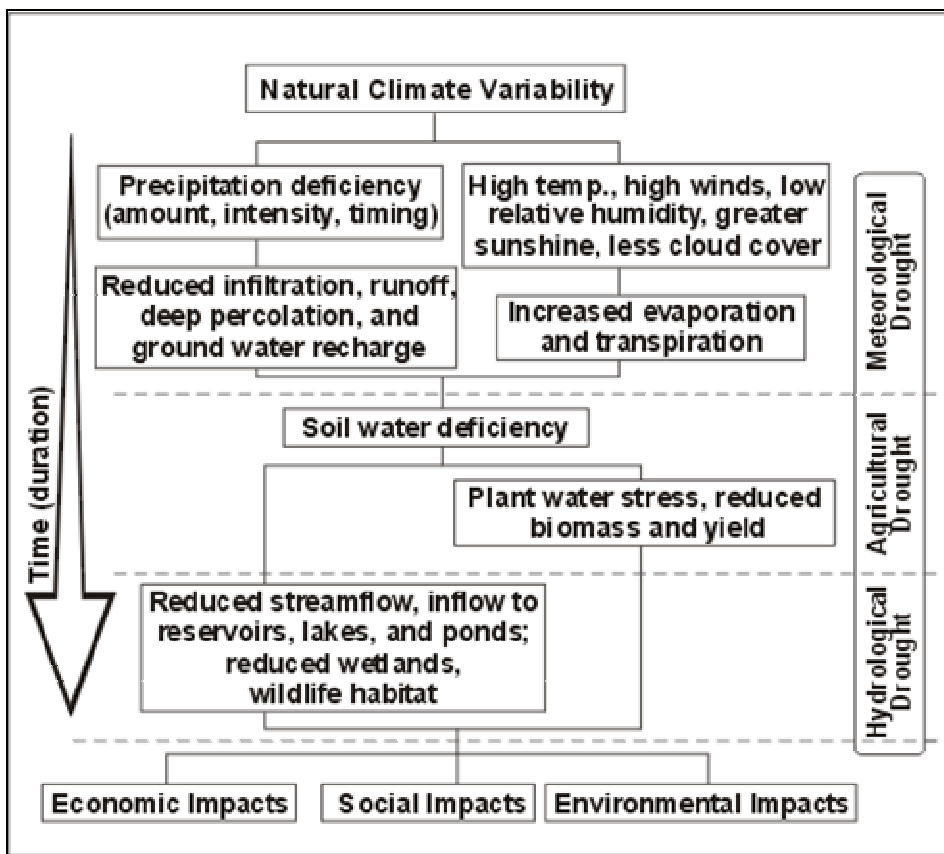
ii. Agricultural Drought

Agricultural drought links various characteristics of meteorological (or hydrological) drought to agricultural impacts, focusing on precipitation shortages, differences between actual and potential evapotranspiration, soil water deficits, and so forth. It happens after meteorological drought but before hydrological drought. A good definition of agricultural drought should be able to account for the variable susceptibility of crops during different stages of crop development, from emergence to maturity. Deficient topsoil moisture at planting may hinder germination, leading to low plant populations per hectares and reduction of final yields. However, if topsoil moisture is sufficient at this early stage, it may not affect final yield (Verdin J., 2007 & Sara, 2009). Agricultural drought definition is used throughout this paper.

iii. Hydrological drought

Hydrological drought is associated with the effects of periods of precipitation on surface or subsurface water supply (i.e., stream flow, reservoir and lake levels, and ground water). The frequency and severity of hydrological drought is often defined on a watershed or river basin scale. The inter-relationships of drought types, the factors associated with each and their impacts are summarized in the Figure 1 below.

Figure 1: Socio-economic and Environmental Impacts; Drought processes, factors, relationships and impacts.



Source: National Drought Mitigation Center (2007)

2.3. Impacts of Drought

Natural and human-made disasters have been experienced throughout history. In the last three decades, however, both the frequency of their occurrence and the losses associated with them has increased. The incidence and magnitude of disasters today is widely recognized as posing a serious threat to the survival, dignity and livelihoods of countless individuals, particularly the poor(Sara, 2009).

Ethiopia is vulnerable to disasters caused by drought, earthquake, flood, war and conflict, human and livestock diseases, pests, and wildfire amongst others. These different hazards occur with varying frequency and severity. Some result in nationwide disasters, while the impacts of others are more localized. However, hydro-meteorological hazard, particularly drought has remained the leading cause of disaster and human suffering in Ethiopia in terms of frequency, area coverage and the number of people affected. Although drought is a natural phenomenon that occurs in many countries, it does not necessarily lead to disaster by itself. It usually develops into disaster only in vulnerable societies. Ethiopia is one of the poorest countries in the world and therefore vulnerable to shocks. Under the Ethiopian context, drought is more or less synonymous with disaster (Ibid).

The capacity to cope with drought has declined because of the increasing human and livestock population pressure resulting in serious natural resources degradation. Though drought can be assumed as a natural disaster, land degradation has made Ethiopia vulnerable to drought and famine. Since the 1983-1984 famine, the policy response to this threat has been a series of adhoc emergency appeals on a near annual basis for food aid and other forms of emergency assistance which are then delivered either as payment for public works or as a direct transfer. While these measures succeeded in averting mass starvation, especially among those with no assets, they did not banish the threat of further famine, nor did they prevent asset depletion by marginally poor households affected by recurrent droughts. As a result, the number of individuals in need of emergency food assistance rose from approximately 2.1 million people in 1996 to 13.2 million in 2003 before falling back to 7.1 million in 2004 (World Bank,2004).

The high proportions of households that receive emergency food aid are “chronically food insecure” – they face predictable annual food deficits caused by agricultural production constraints and poverty. These the people are also exposed to recurrent shocks, usually triggered by drought, that raise their vulnerability further, by forcing them to dispose of their assets to survive. This results in a gradual deterioration of their food security status over time, which decades of large-scale food aid deliveries have done little to prevent. Instead, dependency on food aid has steadily increased over time, as has the number of chronically food insecure Ethiopians. Further, the ad hoc nature of emergency appeals meant that the provision of emergency assistance—often in the form of food-for-work programs—was not integrated into ongoing economic development activities (Subbarao and Smith, 2003).

Recognizing this dilemma, in 2005 the Government of Ethiopia initiated a Productive Safety Net Programme (PSNP), with the objectives of reducing household vulnerability to the effects of disaster mainly drought, improving household and community resilience to shocks, and breaking the cycle of dependence on food aid. The overarching principle of the Productive Safety Net Programme is to facilitate “a gradual shift away from a system dominated by emergency humanitarian aid to productive safety net system resources via multi-year framework” (Government of Ethiopia, 2004). However, this program by itself is limited to certain areas that are historically said to be drought-prone areas. And its effect is not as such feasible in many areas of the country.

One of the main departures of this new direction is the provision of relief in ways that will support recovery and long term development through employment generation on development activities such as soil and water conservation, rural road building and other efforts to build community assets; provide employment based safety net programmes and protect household assets so as to prevent poor households from falling further towards destitution, vulnerability to future shocks particularly drought and chronic dependence on external assistance(Sara, 2009). The Productive Safety Net Program has two components: namely,

Public Works – Provision of counter-cyclical employment on rural infrastructure projects such as road construction and maintenance, small-scale irrigation and reforestation,

Direct Support – provision of direct unconditional transfers of cash or food to vulnerable households with no able-bodied members who can participate in public works projects (Ibid).

The PSNP is complemented by a series of activities, such as productivity-enhancing transfers or services, including access to credit, agricultural extension services, technology transfer (such as advice on food crop production, cash cropping, livestock production, and soil and water conservation), and irrigation and water harvesting schemes. The PSNP is designed to protect existing assets, ensure a minimum level of food consumption, and encourage households to increase income generated from agricultural activities and to build up assets.

2.3.1. Impacts of Drought on Agrarian Livelihood and Societies

Some of the finest work in the world on analyzing livelihoods has been conducted in Ethiopia. In its least elegant form, the term “livelihoods” can be defined as the sum of means by which people get by over time. Household livelihood systems are based on a range of assets (human, financial, social, natural and physical), the use of which is shaped by both formal and informal processes, institutions and policies (PIPs). Livelihood frameworks are useful for understanding household and community resilience, for analyzing vulnerability, and for designing, monitoring and evaluating relief and development policies and practice.

The vulnerability of agrarian societies to droughts depends closely on the societies’ access to assets of different types. It primarily affects the natural and physical asset bases, making farming more difficult and unpredictable. Further it also degrades farmland and damage farm property as well as public infrastructure such as roads and irrigation channels. Drought effects will be also seen in changes in crop seasonality and yield caused by higher mean temperatures and decline in rainfall. The rural poor are

particularly vulnerable to these physical losses, since they lack other assets, in particular human and financial capital, with which to offset them. They may have some bonding social capital, but as livelihood sources are eroded, so too will be their social capital—for example when family members migrate away, as has happened during droughts in Mexico (Jorgen, 2010). Alternatively, social capital may simply become exhausted after a succession of severe weather events.

2.3.1.1. Impacts of Drought on Agriculture

Droughts affect virtually all aspects of agricultural and other water-intensive activity and impact on a large proportion of households, with far-reaching consequences throughout the economy. The recent drought episodes experienced reveal that droughts are not once-off disasters. They are frequent phenomena that can be forecasted, and they will occur at least in the foreseeable future (Sara, 2009).

Droughts entail loss of assets in the form of crops, livestock, and productive capital damaged as a direct consequence of water shortages or related power cuts. Some of the droughts had a drastic impact on agricultural out-put, with total crop failure and massive livestock deaths being recorded in many parts of the country. For instance, the 1984 drought in Tigray led to a 61% and 94% decline in the yield of teff and sorghum, respectively (Mulat, 2004). Because such a high percentage of the population is rural and depends on farmland for subsistence, variations in the weather have powerful consequences.

The capacity to cope with drought has declined because of the increasing human and livestock population pressure resulting in serious natural resources degradation. Though drought can be assumed as a natural disaster, land degradation has made the region vulnerable to drought and famine. Degradation of the agricultural resource base, particularly through intensified land use of the ecologically fragile land by a rapidly growing population together with over grazing, deforestation and soil erosion, has been partly responsible for the increasing vulnerability of the rural population to drought and famine. Such practice aggravates the vulnerability of the region to drought (Ibid).

Drought affects cropping systems directly and indirectly through a range of pathways (Tubiello et al., 2007 cited in Oselen, 2010). The effects are mediated through the farmer's management of the interactions between crops and their growth environment, which depend crucially on available resources, including climate, soil, water, nutrients, genetic diversity, and machinery or labor (Olesen, 2010).

Drought also affects livestock production in two ways: indirectly, by influencing the productivity of grassland and hence the quantity and quality of fodder, and directly by causing more heat- and disease-related stress and death (Zhao et al., 2005). In regions that are currently warm and dry, it will mostly affect both those aspects negatively (Ibid).

Drought could be particularly damaging to countries in Africa, and Ethiopia, being dependent on rain fed agriculture and under heavy pressure from food insecurity and often famine (CEEP, 2006).

In Ethiopia, Small-scale farmers who are dependent on low input and low output rain-fed mixed farming with traditional technologies dominate the agricultural sector. The present government of Ethiopia has given top priority to this sector and has taken steps to increase its productivity. However, various problems are holding this back. One major cause of underproduction is drought, which often causes famine, and floods. This disaster makes the nation dependent on food aid (Ibid).

2.3.1.2. Social Impacts of Drought

During drought times, water level goes down and springs and streams decrease significantly and some even dry up. In addition to failure in crop production, sanitation will loose attention under the prevalence of drought conditions. This is so because of personal hygiene such as washing of body, cloth, etc. require the availability and supply of water. The prevalence of drought forces people to look for opportunities for survival including abandoning their home and migrating to camps where they see some temporary help to rescue their life. Those who are unable to move or cope up with the drought are

doomed to perish. As drought persists human and livestock death toll increases compounded by poor sanitation and deteriorating natural environment. On the other hand drought shock increases the prevalence of diarrhea among the children. According to the statistics of the Regional Health Bureau, 7,122 cases of diarrhoea in children were reported in 2003 (drought year) in the whole region, an increase of 17 percent compared with normal levels. The increase was attributed to water scarcity.

In addition to threatening the health and welfare of children, the recurrent drought is also effectively suspending their education. Primary schools are closing down as children leave to help support individual family incomes during severe drought event. Schooling is not only vital to a child's development; it helps provide a sense of security and continuity during times of disaster and stress.

In many parts of the region, the effects of drought on ecosystems have begun to compromise the traditional livelihoods and lifestyles of indigenous peoples who depend on them. The increased drought risks to agriculture, property, infrastructure, and ecosystems are likely to have negative effects on health by impeding access to safe water sources and sufficient food (FAO, 2007).

2.4. Vulnerability

2.4.1. The concepts of vulnerability: Definitions and Issues

The Intergovernmental Panel on Climate Change (IPCC) and world conference on disaster prevention (WCDP), defines vulnerability as “the extent to which climate socks such as drought may damage or harm a system.” It adds that vulnerability “depends not only on a system’s sensitivity, but also on its ability to adapt to new drought conditions” (Santiago, 2001).

The IPCC (2007b) defines the concept of vulnerability as

the degree to which a system is susceptible to, or unable to cope with, adverse effects of drought. Vulnerability is a function of the character and magnitude, of drought to which a system is exposed, its sensitivity, and its adaptive capacity (WCDP, 2004; IPCC, 2007b cited in Mirjam, 2008).

This definition implies that in order to assess future vulnerability of a system to drought not only the exposure of a system to a potential future biophysical hazard level at a global, regional or local scale needs to be considered, but also the sensitivity of vulnerable groups and the ecosystems they live in to drought impacts and their adaptive capacity.

The WCDP report, *The Regional Impacts of drought: An Assessment of Vulnerability* (Watson et al., 1998), argues that the vulnerability of a region depends to a great extent on its wealth, and that poverty limits adaptive capabilities. According to the *Second Assessment Report*, vulnerability depends on the level of economic development and institutions. The report argues that socio-economic systems “typically are more vulnerable in developing countries where economic and institutional circumstances are less favorable” (Watson et al., 1996: 24).

A common theme in the drought impacts and vulnerability literature is the idea that countries, regions, economic sectors and social groups differ in their degree of vulnerability to drought (Bohle et al., 1994). This is due partly to the fact that changes in temperature and precipitation will occur unevenly and the fact that resources and wealth are distributed unevenly. Though vulnerability differs substantially across regions, it is also recognized that “even within regions... impacts, adaptive capacity and vulnerability will vary” (WCDP, 2004:2; IPCC 2001: 15).

2.4.2. Approaches of vulnerability

Vulnerability can be conceptualized in many different ways along a continuum from outcome to contextual vulnerability. Outcome vulnerability is characterized by the degree, to which a system is susceptible to, or unable to cope with, adverse effects of drought, while contextual vulnerability assesses ‘the susceptibility of a system to disturbances determined by exposure to perturbations, sensitivity to perturbations, and the capacity to adapt (Pearson and Langridge, 2008). Furthermore, vulnerability is influenced by both physical and socio-economic characteristics which are themselves not static implying that vulnerability is context specific, and specific to place, time and the perspective of those assessing it (Adger,

1996; Aandahi, and O'Brien., 2001). The context specific nature of vulnerability means that there can be no single, unified or general purpose approach to conceptualizing it (Pearson and Langridge, 2008 cited in Ignatus, 2006).

There are however three major conceptual approaches to analyzing vulnerability to drought: the socio-economic, the biophysical (impact assessment), and the integrated assessment approaches. Although each has its strong points and weaknesses, the integrated approach has much to offer in terms of policy decisions (Deressa et al., 2008). Now, let's briefly see each approach one by one.

2.4.2.1. Socio-economic Approach

The socio-economic vulnerability assessment approach mainly focuses on the socio-economic and political status of individuals or social groups (Adger, 1999; Füssel, 2007). Individuals in a community often vary in terms education, gender, wealth, health status, access to credit, access to information and technology, formal and informal (social) capital, political power, and so on. These variations are responsible for the variations in vulnerability levels. In this case, vulnerability is considered to be a starting point or a state (i.e., a variable describing the internal state of a system) that exists within a system before it encounters a hazard event (Allen, 2003; Kelly and Adger, 2000). Thus, vulnerability is considered to be constructed by society as a result of institutional and economic changes (Adger and Kelly, 1999). In general, the socioeconomic approach focuses on identifying the adaptive capacity of individuals or communities based on their internal characteristics. A study by Adger and Kelly (1999) is an example of this approach. In that study, the environmental factor in a district to coastal lowlands of Vietnam was taken as given, and vulnerability was analyzed based only on variations in socio-economic attributes of individuals and social groups.

2.4.2.2. Bio-physical Approach

The biophysical approach assesses the level of damage that a given environmental stress causes on both social and biological systems. For instance, the monetary impact of drought on agriculture can be measured by modeling the relationships between extent of drought and farm income (Mendelsohn, et al., 1994; Polsky and Esterling, 2001; Sanghi, et al., 1998).

Similarly, the yield impacts of drought can be analyzed by modelling the relationships between crop yields and drought extent (Adams, 1989; Kaiser et al., 1993; Olsen, et al., 2000). Other related impact assessment studies include the impact of drought on human mortality and health terms (Martens et al., 1999), on food and water availability (DuToit et al., 2001; FAO, 2005; Xiao et al., 2002), and on ecosystem damage (Forner, 2006; Villers-Ruiz and Trejo-Vázquez, 1997). The damage is most often estimated by taking forecasts or estimates from drought prediction models (Kurukulasuriya and Mendelsohn, 2006; Martens et al., 1999) or by creating indicators of sensitivity by identifying potential or actual hazards and their frequency (Cutter et al., 2000).

Füssel (2007) identified this approach as a risk-hazard approach and denoted the vulnerability relationship as a hazard-loss relationship in natural hazard research, a dose-response or exposure-effect relationship in epidemiology, and a damage function in macroeconomics. Kelly and Adger (2000) referred to the biophysical approach as an end-point analysis responding to research questions such as, “What is the extent of the drought problem?”

2.4.2.3. The Integrated Assessment Approach

The integrated assessment approach combines both socioeconomic and biophysical approaches to determine vulnerability. The hazard-of-place model (Cutter et al., 2000) is a good example of this approach, in which both biophysical and socioeconomic factors are systematically combined to determine vulnerability. The vulnerability mapping approach (O’Brien et al., 2004) is the other related example, in which both socio-economic and biophysical factors are combined to indicate the level of vulnerability through mapping.

Füssel (2007) and Füssel and Klein (2006) argued that the IPCC (2001) definition—which conceptualizes vulnerability to drought as a function of adaptive capacity, sensitivity, and exposure—accommodates the integrated approach to vulnerability analysis. According to Füssel and Klein (2006), the risk-hazard framework (biophysical approach) corresponds most closely to sensitivity in the IPCC terminology. Adaptive capacity (broader social development) is largely consistent with the socio-economic approach (Füssel, 2007). In the IPCC framework, exposure has an external dimension, whereas both sensitivity and adaptive

capacity have internal dimension, which is implicitly assumed in the integrated vulnerability assessment framework (Füssel, 2007).

2.4.3. Methods for Measuring Vulnerability to Drought Impacts

Based on the previously discussed approaches, there are many methods for analyzing vulnerability to drought, especially in the biophysical or impact assessment methods. According to Deressa et al.(2008), the most commonly used methods of analyzing vulnerability to drought employed in most literature includes;

2.4.3.1. Econometric Method

The econometric method has its roots in the poverty and development literature. This method use household-level socio-economic survey data to analyze the level of vulnerability of different social groups. The method is divided into three categories: vulnerability as expected poverty (VEP), vulnerability as low expected utility (VEU), and vulnerability as uninsured exposure to risk (VER) (Hoddinott and Quisumbing, 2003). All three share common characteristics in that they construct a measure of welfare loss attributed to shocks.

i). Vulnerability as Expected Poverty

In the expected poverty framework, vulnerability of a person is conceived as the prospect of that person becoming poor in the future if currently not poor or the prospect of that person continuing to be poor if currently poor (Christiaensen and Subbarao, 2004). Thus, vulnerability is seen as expected poverty, and consumption (income) is used as a proxy for well-being. This method is based on estimating the probability that a given shock, or set of shocks, moves consumption by households below a given minimum level (e.g., consumption poverty line) or forces the consumption level to stay below the given minimum requirement if it is already below that level (Chaudhuri et al., 2002).

ii). Vulnerability as a Low Expected Utility

Ligon (2002) and Schechter (2002, 2003) defined vulnerability as the difference between the utility derived from some level of certainty-equivalent consumption at and above which the household would not be considered vulnerable and the expected utility of consumption.

Ligon and Schechter (2003) applied this method to a panel data set from Bulgaria in 1994 and found that poverty and risk play roughly equal roles in reducing welfare. The disadvantage of this method is that it is difficult to account for an individual's risk preference, given that individuals are ill informed about their preferences, especially those related to uncertain events (Kanbur, 1987).

iii). Vulnerability as Uninsured Exposure to Risk

The VER method is based on ex post facto assessment of the extent to which a negative shock causes welfare loss (Hoddinott and Quisumbing, 2003). In this method, the impact of shocks is assessed by using panel data to quantify the change in induced consumption. Skoufias (2003) employed this approach to analyze the impact of shocks on Russia. In the absence of risk-management tools, shocks impose a welfare loss that is materialized through reduction in consumption. The amount of loss incurred due to shocks equals the amount paid as insurance to keep a household as well off as before any shock occurs. The disadvantage of this method is that in the absence of panel data sets, estimates of impacts—especially from cross-sectional data—are often biased and thus inconclusive.

2.4.3.2. Indicator Method

The indicator method of quantifying vulnerability is based on selecting some indicators from the whole set of potential indicators and then systematically combining the selected indicators to indicate the levels of vulnerability. These levels of vulnerability may be analyzed at local (Adger, 1999; Leon, 2003; Morrow, 1999), national (O'Brien et al., 2004), regional (Leichenko and O'Brien, 2001; Vincent, 2004), and global (Brooks, 2005; Moss, 2001) scales.

Two options are available for calculating the level of vulnerability using this method at any scale. The first is assuming that all indicators of vulnerability have equal importance and thus giving them equal weights (Cutter, 2000). The second method is assigning different weights to avoid the uncertainty of equal weighting given the diversity of indicators used. In line with the second method, many methodological approaches have been suggested to make up for the weight differences of indicators. Some of these approaches include use of expert judgment

(Kaly and Pratt, 2000; Kaly et al., 1999), principal component analysis (Easter, 1999; Cutter, 2003), correlation with past disaster events (Brooks, 2005), and use of fuzzy logic (Eakin and Tapia, 2008). Even though there are attempts in giving weights, their appropriateness is still dubious; because there is no standard weighting method against which each method is tested for precision.

2.4.4. Determining factors of vulnerability to drought impacts

The vulnerability factors which are thought to have a direct influence on the social and biophysical vulnerability of local communities to drought impacts are described below. But, the identification of vulnerability factors should not be considered comprehensive.

2.4.4.1. Social vulnerability factors

According to Brooks (2003), social vulnerability exists within a system independently from external hazards and is therefore not a function of the frequency and severity of a given type of hazard but of factors which are incorporated within a human system, for example poverty and inequality, marginalization, literacy, food entitlement, health and so forth.

Poverty and inequality

Insufficiency of income, assets or wealth is one of the most important determining factors of socio-economic vulnerability of local/indigenous peoples. For many of them, subsistence agriculture remains the core of the household economy, and food consumption is therefore both the driving force as well as the outcome of indigenous livelihood systems. They often have very limited additional income from cash crops or other activities, and are highly dependent on natural resources. Drought induced hazards could have devastating impacts on indigenous peoples' lives and livelihoods (Mirjam, et al., 2008).

A recent study of the World Bank (Hall & Patrinos, 2004) has shown that local/indigenous peoples in Latin America remain among the poorest of the region with very little alleviation of poverty over the past decade, while in some places their overall situation even worsened. Drought is likely to further aggravate the situation of indigenous peoples, especially those living in places that are susceptible to natural disasters, and will consequently further limit their ability to cope with or recover from shocks (DFID, 2004).

Health and nutrition

Communities which are already suffering from bad health conditions and malnutrition are suggested to be more vulnerable to drought impacts and to have a lower adaptive capacity compared to healthy communities. The WCDP (2004) predicts that drought will further weaken the health status of millions of people particularly those with low adaptive capacity. The expected health risks related to drought are significant including malnutrition in response to increased competition for crop and water resources; deaths caused by heat waves, spatial distribution of infectious vector-borne diseases causing for example malaria and dengue fever, and of water-borne diseases as a result of reduced water quality causing increased incidences of diarrhoea and respiratory diseases (DFID, 2004). The World Health Organization (WHO, 2003) estimated that in the year 2000, climate related shocks especially; drought was responsible for approximately 2.4 per cent of worldwide diarrhoea, and six per cent of malaria in some middle-income countries (Mirjam, et al., 2008).

Social networks

Indigenous/local peoples highly rely on social networks. They often maintain social and economic ties between different groups of peoples and in many places they still support systems of food and labour sharing including exchange, reciprocity, barter or local markets. Such exchange practices have a role to play as adaptation strategies to environmental variability and stress. In the future, these practices could gain importance when these peoples, as a result of adverse impacts of drought, might become increasingly dependent on non-locally available resources. However, in the future some of these reciprocal systems may also disappear, as certain groups may become more disadvantaged than others (Salick, and Byg eds., 2007 cited in Mirjam et al., 2008).

Marginalization: Deprivation from power, information and technology

Many of the local/indigenous people have been pushed to the least fertile and most fragile lands where living conditions are harsh and challenging and where they struggle to survive as a consequence of historical social, political and economic rejection and exclusion. As a result of their marginalization and exclusion, they often do have very limited access to education, health care, information, technologies, power, resources and national or international aid.

With exceptions, they have very limited access to power and decision making (Mirjam, 2008).

Local/Indigenous peoples base their adaptation measures on their traditional knowledge, which largely develops based on their own observations and interpretation of climate variability and change. Nevertheless, their own observations and weather forecasting systems in the future may become less meaningful or even mislead them in their decisions, due to more rapid and complex global climate change. Facilitated access to scientific information and technology such as early warning systems, evacuation strategies or improved building techniques may help decrease indigenous peoples' vulnerability to hazards (Ibid).

Diversified livelihoods

Another important factor which influences socio-economic vulnerability is the maintenance of a diversified resource base which is a prerequisite for adaptation to drought. Diversified livelihood systems allow indigenous communities to draw on various sources of food and income and in doing so, spreading the risks of vulnerability to drought. Diverse crops and varieties reduce the risk of crop failure. However, even though it is widely accepted that livelihood diversification in general is increasing the resilience of poor communities, it should be considered that diversification of livelihoods exclusively within natural-resource use might reinforce vulnerability to drought. That is, if the climate for agriculture is becoming more and more variable and unpredictable, it may become necessary for indigenous peoples to supplement their subsistence livelihoods with income gathering activities beyond agriculture in order to minimize their susceptibility to hazards (Thomas and Twyman, 2005).

Land tenure and access rights

A Land tenure and access rights is also another crucial factor that determines the vulnerability of community to drought impacts.

2.4.4.2. Biophysical vulnerability factors

Biophysical vulnerability is interpreted as the amount of damage experienced by a system caused by the impacts of a specific type of hazard and is therefore, in contrast to social vulnerability, a function of the frequency and severity of given types of hazards (Brooks, 2003).

Availability of natural resources

Local/ indigenous communities are highly reliant on natural resources which they use in many different ways - as food, wood for timber or fuel, fibre for clothing, medicinal plants for health care, materials for income generating activities – and depend on for spiritual purposes. Due to the effects of drought, the availability and distribution of these resources are expected to be directly affected. This could increase the socio-economic and biophysical vulnerability of these peoples, possibly putting them at severe risk. For example, increased frequencies of hazards such as droughts and floods are projected to affect local production negatively, possibly leading to crop failure, especially in subsistence sectors at low latitudes (IPCC, 2007b). In addition, it has been projected that the availability and quality of water will decrease and that there will be a loss of biodiversity which is expected to have fundamental impacts on indigenous peoples' environmental management and livelihoods (Ibid).

Location of residence

Exposure to drought impacts depends on where people choose or are forced to live (Brooks, 2003). Local people who often live in physically isolated, fragile and harsh environments are vulnerable to environmental change due to their latitude, topography, distance from the sea, soil's quality etc.

Land use and land cover change

Changes in land use and land cover are additional factors which have implications on the vulnerability of local/ indigenous peoples. Land cover is defined as

the observed physical cover including the vegetation (natural or planted) and human constructions which cover the earth's surface. Water, ice, bare rock or sand surfaces count as land cover (GTOS, 2007).

Changes in land cover and land use are directly or indirectly affected by drought and local peoples' degree of vulnerability is expected to be seriously influenced by land use and land cover change. Land cover change caused by drought and other climate related shocks could force them to adapt to new circumstances and alter their traditional ecosystem management systems.

2.5. Drought Management and Adaptation Strategy

2.5.1. Drought management strategy

Drought, unlike other natural disasters such as floods or earthquakes, does not occur abruptly, but it evolves over a long period of time (Roossi, 2003). Such feature makes possible an effective mitigation of drought impacts, if a timely and reliable drought monitoring system is in operation (Cancelliere et al., 2007) and an appropriate plan, including the necessary actions to reduce the most severe damages caused by drought (in economic, social and environmental terms), has been prepared (Roossi, 2003).

Drought management is a process of reducing and managing the impact of drought in order to prevent it turning into a famine (Carney, 1998). "Management" is generally defined as "the coordination of organized effort to attain specific goals or objectives". In emergency or disaster management, the term means "an organized effort to mitigate against, prepare for, respond to, and recover from disaster". Drought management has four main elements, namely; Preparedness, Mitigation, Relief and Reconstruction.

Preparedness - This concept implies "planning how to respond in case a drought occurs and working to increase resources available to respond effectively". The rationale behind this arrangement is to save lives and minimize damage by preparing people to respond appropriately when a drought is imminent.

Mitigation – These are activities which eliminate or reduce the chances of occurrence or effects of a drought. This approach is based on the idea that much can be done to prevent droughts from happening or reduce their impact.

Relief - The concept applies to “activities that occur during and immediately following a drought”. Through proper response, emergency assistance to victims of the drought is provided.

Reconstruction – This continues until all systems return to or are near normal. Short-term recovery returns vital life support systems to minimum operating standards. Long-term recovery may go on for years until the entire drought affected area is completely restored.

All these elements of disaster management are closely inter-linked with development. Effective planning must consider the relationship between disasters and development to avoid set backs. Disaster prevention, preparedness and recovery programmes provide significant opportunities to initiate long-term development programmes which reduce vulnerability to droughts.

The traditional approach to drought management has been reactive, relying largely on crisis management. This approach has been ineffective because response is untimely, poorly coordinated, and poorly targeted to drought stricken groups or areas (Wilhite, 1997). In addition, drought response is post-impact and relief tends to reinforce existing resource management methods that quite often have increased societal vulnerability to drought.

The new strategy emphasizes a shift from Crisis Management to Risk Management (Wilhite, 1997). It is a holistic approach to drought management involving forecasting, prevention, mitigation and preparedness in pre-drought phase along with the policy practiced so far of post-drought measures of relief and rehabilitation under crisis management. This strategy involves extensive scientific and technological inputs for data collection, analysis, modeling and forecasting drought.

Drought is a complex natural phenomenon and should be approached from a multidimensional and multidisciplinary perspective (IWMI, 2004). Drought need to be viewed as long term development issue, and as such it is important to recognize that

droughts require a multi-sectoral response, involving agriculture and rural development, and environmental and water resource management (Gautam ,2006).

Drought preparedness plans promote a more preventive, risk management approach to drought management. They reduce vulnerability to drought and dependence on emergency assistance from governments and international organizations. The process of developing a plan identifies vulnerable areas, population groups, and economic and environmental sectors. Ultimately, preparedness plans will improve coordination within and between levels of government; procedures for monitoring, assessing, and responding to water shortages; information flow to primary users; and efficiency of resource allocation. The goals of these plans are to reduce water shortage impacts, personal hardships, and conflicts between water and other natural resource users. To be successful, drought preparedness plans must be integrated between levels of government and with other national plans or strategies, such as those to ensure food security and creates drought resilient society.

Drought preparedness plans contain three critical components: (1) a comprehensive early warning system; (2) risk and impact assessment procedures; and (3) mitigation and response strategies. These components complement one another and represent an integrated institutional approach that addresses both short- and long-term management and mitigation issues.

A drought early warning system is designed to identify climate and water supply trends and thus to detect the emergence or probability of occurrence and the likely severity of drought. This information can reduce impacts if delivered to decision makers in a timely and appropriate format and if mitigation measures and preparedness plans are in place (Pereir et al., 2009). Besides, understanding the underlying causes of vulnerability is also an essential component of drought management because the ultimate goal is to reduce risk for a particular location and for a specific group of people or economic sector.

In agriculture, development of data bases information and communication technologies and communication pathway between farmers and grower associations and even extension

services can greatly assist in timely adaptation on non-routine measures to cope with drought (Wilhite and Pulwarty, 2005). Short time drought predication is important for warning farmers about the probable initiation or establishment of drought, about its continuation or its probable termination in a few months. This information may help them to make decision to cope with that predicted situation. Short time drought prediction may also be used to alter policy makers about the need to enforce appropriate preparedness measure before a drought is effectively installed, or to prepare for a post-drought period (Wilhite and Pulwarty 2005).

To cope with droughts require preparatory measures, contingency plans that support the timely implementation of mitigation measures and the forecast impacts which are likely to be experienced once the drought becomes established and evolves. This implies risk-based drought policies and effective monitoring and early warning systems. However, this is only possible for a society that has strong institutions and where public participation forces policy-makers to adopt drought risk policies and make the society resilient to drought (Wilhite and Buchanan-Smith, 2005). In drought resilient societies, where drought risk management could be adopted, where awareness is appropriate for timely implementing of mitigation measures, there is the need for a proactive approach. This consists of planning during the no-drought period, implementation during drought and monitoring and evaluation during and after the drought event.

In general, all the three components complement one another and represent an integrated institutional approach that addresses both short and long-term drought management. In particular, the key issue for implementing an efficient drought management strategy consists in identifying in advance measures to mitigate drought impacts on the water supply systems, the productive sectors and the environment. To this end, the formulation of guidelines for the definition of drought mitigation measures and for their appropriate use, in relation to the different drought conditions, can be extremely helpful.

2.5.2. Adaptations/Coping Mechanisms to Drought Impacts

2.5.2.1. Definitions and Issues

According to Burton et al (1993), the term “adaptation measures” covers eight categories: bearing losses (doing nothing), sharing losses, modifying the threat and thus preventing effects, changing use, changing location, accessing new research based technologies, disseminating knowledge through education to change behavior, and restoration. Others have classified the different forms of adaptation as anticipatory and reactive adaptation, private and public adaptation, and autonomous and planned adaptation (IPCC, 2001 cited in Yohannes and Mebratu, 2009).

Adaptation as applied to climate change hazards such as drought is a very broad concept, and the concept is defined differently in the literature, as indicated below:

- ✓ Adaptation to drought is the process through which people reduce the adverse effects of drought on their health and well-being (Burton, 1992).
- ✓ The term adaptation means any adjustment, whether passive, reactive or anticipatory, that is proposed as a means for ameliorating the anticipated adverse consequences associate with drought (Stakhiv, 1993 quoted in Smit et al., 2000).
- ✓ Adaptation involves adjustments to enhance the viability of social and economic activities and to reduce their vulnerability to drought (Smit 1993; WCDP, 2004; IPCC, 2007b).
- ✓ Adaptation to climatic shocks such as drought includes all adjustments in behavior or economic structure that reduce the vulnerability of society to the shocks (Smith et al. 1996, quoted in Smit et al., 2000); and
- ✓ Adaptability refers to the degree to which adjustments are possible in practices, processes or structures of systems to projected or actual drought. Adaptation can be spontaneous or planned, and can be carried out in response to or in anticipation of change in conditions (Watson et al., 1996, quoted in Smit et al., 2000).

Smit et al. (2000) also discuss various typologies and distinctions related to the process of adaptation which appear in the literature. For example, according to some of the typologies

considered, adaptation can be planned or spontaneous; passive, reactive or anticipatory, etc. From their point of view, it may be that planned, anticipatory adaptations that are undertaken by governments or NGOs as a policy initiative (as opposed to those that are autonomous and/or mainly reactive) are those that require the most attention. Though, as argued by Fankhauser et al. (1999), the distinction between autonomous and planned adaptation may be blurred in practice. The evaluation of adaptations must address the following question: “how good is the adaptation?” (Smit et al., 2000). Furthermore, it is important to assess not only the “best” adaptation options, but also what adaptations are likely in various settings.

According to the WCDP, adaptation “has the potential to reduce adverse impacts of drought, but will incur costs and will not prevent all damages.” Furthermore, it is argued that human and natural systems will, to some extent, adapt autonomously and that planned adaptation can supplement autonomous adaptation. However, “options and incentives are greater for adaptation of human systems than for adaptation to protect natural systems” (WCDP, 2004:4).

The propensity of systems (e.g., socio-economic systems) to adapt is influenced by certain system characteristics that have been called “determinants of adaptation” in the literature. These include terms such as “sensitivity,” “vulnerability,” “resilience,” “susceptibility” and “adaptive capacity,” among others. The occurrences as well as the nature of adaptations are influenced by these. As Smit et al. (2000) point out; there is some overlap in the concepts captured in these terms. The same authors argue that sensitivity, vulnerability and adaptability capture the broad concepts. Definitions of terms that describe system characteristics that are relevant for adaptation include the following:

Sensitivity: degree, to which a system is affected by, or responsive to, drought,

Vulnerability: degree to which a system is susceptible to injury, damage or harm

Impact potential: degree, to which a system is susceptible to drought,

Resilience: degree to which a system rebounds, recoups or recovers from a stimulus

Responsiveness: degree to which a system reacts to stimulus

Adaptive capacity: the potential or capability of a system to adapt to (to alter to better suit) drought crisis,

Adaptability: the ability, competency or capacity of a system to adapt to (to alter to better suit) drought disaster

Building on some of this literature, and on its previous work, the most recent definitions adopted by the WCDP (2004) AND IPCC (2001, 2007b cited in Mirjam, 2008) are the following:

Sensitivity: the degree to which a system is affected, either adversely or beneficially, by climate-related shocks such as drought.

Adaptive capacity: the ability of a system to adjust to drought and to moderate potential damages, or to cope with the consequences.

2.5.2.2. Local adaptation/coping mechanisms to the impacts of drought

There is a rich set of local/indigenous strategies to deal with multiple threats, variability and environmental change, but they are not sufficient for reducing the impacts of drought. People normally rely on a number of different activities for food and income in addition to, for example, agriculture. This diversification is common for most groups, whether smallholder farmers, pastoralists, rural or urban workers or unemployed slum dwellers. In particular, during droughts or floods when farming fails, farmers engage in a diversity of activities. While sale of poultry and livestock, informal trade and casual employment are coping strategies common to most areas of eastern Africa, the exact combination of activities in which a household engages depends both on the options available locally and the labor availability, education, skills, and access to capital of the household or individuals within it. In addition to resource access, strong local links between and within social groups and local knowledge of environmental processes are important for coping and adapting (Eriksen et al., 2008).

The notion that Africa has low adaptive capacity due to a low financial, technological and institutional capacity needs to be nuanced by the fact that a wealth of coping and adaptation strategies exist at the household and village level. However, the existence of these strategies is no guarantee of successful adaptation in terms of securing basic needs in the face of drought. When a main activity such as agriculture fails, most people lack the skills, labor or capital necessary to specialize in another activity that can take agriculture's place as a

reliable primary income source. Instead, most have to resort to a range of opportunistic activities, including collecting wild foods, producing charcoal and seeking casual employment. As a drought situation intensifies, the options often dwindle and more and more people are pushed into these few activities of marginal and decreasing returns. When faced with severe and prolonged drought events, some of the most vulnerable people have to sell key productive assets such as land, livestock, farm tools, roofs from their homes or even resort to prostitution, thereby endangering their livelihoods in the long term, which for many leads to destitution(Ibid).

One of the reasons that local/indigenous strategies are inadequate is the fact that they largely have to operate without any formal government support or facilitation. Since only minorities have access to formal employment and market-based options, most people rely on informal economic activities. The local knowledge, networks, customary institutions and local biodiversity that are used for coping are often ignored by the formal financial, technological and institutional framework of most countries. Furthermore, policies sometimes inadvertently undermine local coping capacity by restricting flexibility (Ibid).

Agrawal (2008), classified the basic coping strategies in the context of environmental risks to livelihoods into five analytical categories of adaptation responses and their combinations: mobility, which helps address risks across space, storage (time), diversification (asset classes), communal pooling (across households), and market exchange – which can substitute for the above four classes of risk mitigation when households and communities have access to markets.

Mobility -is perhaps the most common and seemingly natural responses to environmental risks. It pools risks across space, and is especially successful in combination with clear information about the spatial and temporal distribution of precipitation. It is especially important as an adaptation strategy for agro -pastoralists in Sub-Saharan Africa, west and south Asia, and indeed most dry regions of the world (Niamir, 1995; Niamir-Fuller, 1999).

Storage -as an adaptation practice to address risks, storage is relevant to individual farmers and communities, and to address food as well as water scarcities. Indeed, in light of the significant losses of food and other perishable commodities all over the developing world, improvements in storage technologies and institutions have immense potential to improve rural livelihoods.

Diversification- pools risks across assets and resources of households and collectives. Highly varied in form, it can occur in relation to productive and non-productive assets, consumption strategies, and employment opportunities. It is reliable to the extent benefit flows from assets are subject to uncorrelated risks (Behnke et al., 1993; Ellis; 2000; Sandford, 1983). Diversifying households typically give up some returns in exchange for the greater security provided by diversification.

Communal pooling-refers to adaptation responses involving joint ownership of assets and resources; sharing of wealth, labor, or incomes from particular activities across households, or mobilization and use of resources that are held collectively during times of scarcity. It pools risks across households. It is most effective when the benefits from assets owned by different households and livelihoods benefit streams are uncorrelated. When a group is affected in a similar manner by adverse climate hazards – e.g., floods or drought, communal pooling is less likely to be an effective response.

Market Exchange -is perhaps the most versatile of adaptation responses. Indeed, markets and exchanges are a characteristic of almost all human groups, and are a mechanism not just for adaptation to environmental risks but also critical for specialization, trade, and welfare gains that result from specialization and trade at multiple scales. Market exchange-based adaptation practices can substitute for the first four when rural poor have access to markets. But they are likely to do so mainly when there are well developed institutions to facilitate market access.

Mirjam et al. (2008) also identifies adaptation strategies to drought impacts as follows:

- a. Crop diversification in order to minimize the risk of harvest failure (many varieties of crops with differing susceptibilities to droughts, floods, pest etc. are grown).

- Some of these varieties are adapted to different environment/field locations (near rivers, high on mountains, close to a primary forest etc).
- b. Changes of living area and a variety of movement patterns are used to deal with drought disaster.
 - c. Change of hunting and gathering periods to adapt to changing animal migration and fruiting periods.
 - d. Change of varieties and species. Livestock varieties may be changed to take account of new disease challenges.
 - e. Changes in food storage methods, such as drying or smoking foods according to climate variability and corresponding availability of food. Changes in food habits, for example when the crops or cultivated plants are not producing good harvests, people will revert to gathering food in the forests. Or people who are close to a town might trade or barter with neighboring villages or traders/markets. Some may even become dependent on international agencies (the World Food Programme, UN agencies etc).

2.6. Adaptation and Sustainable Development

Ability to adapt clearly depends on the state of development (Berke, 1995; Munasinghe, 1998). As Ribot *et al.* (1996) illustrate, underdevelopment fundamentally constrains adaptive capacity, especially because of a lack of resources to hedge against extreme but expected events. The events are not surprises: “It is not that the risk is unknown, not that the methods for coping do not exist...rather inability to cope is due to lack of—or systematic alienation from—resources needed to guard against these events” (Ribot *et al.*, 1996).

The process of enhancing adaptive capacity is not simple; it involves “spurts of growth interdispersed with periods of consolidation, refocusing and redirection” (Holmes, 1996). Enhancement of adaptive capacity involves similar requirements as promotion of sustainable development, including: Improved access to resources, Reduction of poverty, lowering of inequities in resources and wealth among groups, Improved education and information, Respect for accumulated local experience, Active participation by concerned parties,

especially to ensure that actions match local needs and resources, Improved institutional capacity and efficiency and etc (Burton et al. 2006)

Because actions taken without reference to climate shocks such as have the potential to affect vulnerability to it, enhancement of adaptive capacity to drought can be regarded as one component of broader sustainable development initiatives (Ahmad and Ahmed, 2000; Munasinghe, 2000; Robinson and Herbert, 2000). Hazards associated with drought have the potential to undermine progress with sustainable development (Berke, 1995; Wang'ati, 1996). Therefore, it is important for sustainable development initiatives to explicitly consider hazards and risks associated with drought (Apuuli *et al.*, 2000).

Clearly, adaptive capacity to deal with climate risks such as drought, flood is closely related to sustainable development and equity. Enhancement of adaptive capacity is fundamental to sustainable development. For example, in the drought-stricken region of northeastern Brazil, an assessment of past successes and failures has indicated that a comprehensive sustainable development strategy is needed to increase regional and societal capacity to face present and future probability of drought (Magalhães, 1996). By assessing differences in vulnerability among regions and groups and by working to improve the adaptive capacity of those regions and groups, planned adaptation can contribute to equity considerations of sustainable development. In the context of African agriculture, Downing *et al.* (1997) conclude that enhancement of present resource management activities is necessary to prepare for potential impacts of drought.

Many communities and regions that are vulnerable to drought are also under pressure from forces such as population growth, resource depletion, and poverty. Policies that lessen pressures on resources, improve management of environmental risks, and increase the welfare of the poorest members of society can simultaneously advance sustainable development and equity, enhance adaptive capacity, and reduce vulnerability to drought and other stresses. Inclusion of climatic risks in the design and implementation of national and international development initiatives can promote equity and development that is more sustainable and that reduces vulnerability to drought (WCDP, 2004; IPCC, 2001).

2.7. Conclusion

Drought can be defined from different angles by different authors. Some authors defines drought from a deficiency of precipitation over an extended period of time, usually a season or more. Others related drought to the timing (i.e. principal season of occurrence, delays in the start of the rainy season, occurrence of rains in relation to principal crop growth stages) and the effectiveness (i.e., rainfall intensity, number of rainfall events) of the rains. Further, drought can be also identified as agricultural, meteorological and hydrological drought. And this study used agricultural definition of drought.

Drought affects the livelihood of the people in different ways. Especially the impact of drought on crop production and livestock rearing is seen in different parts of the sub-Saharan African countries in general and in Ethiopia in particular. In addition to economic aspects, drought also affects the society in different ways.

Vulnerability is degree, to which a system is susceptible to, or unable to cope with, effects of drought and there are a number of factors that determine vulnerability. These includes, Social vulnerability factors (poverty and inequality, health and nutrition, Social networks, Marginalization, Diversified livelihoods, Land tenure and access rights etc.) and Biophysical vulnerability factors (Availability of natural resources, Location of residence, Land use and land cover changes.).

There are diverse local and institutional coping mechanisms that help people to cope up with the impacts of drought. However, these coping strategies are no sufficient for reducing the impacts of drought in most sub-Saharan African countries in general and in Ethiopia in particular due to low adaptive capacity in terms of finance, technology and institutions in the continent.

Chapter Three

3. Data Presentation, Analysis and Discussion

3.1. Introduction

This part is mainly classified into three major sections. The first part shows the impacts of drought on the livelihoods and consequently on society at large. It is specifically concentrated on how drought affects crop production and livestock rearing in the study area. The second part presents the vulnerability of different social groups, the local and institutional coping mechanism and the major stressors or challenges are presented based on data gathered during the field study. The final part deals with the general discussion.

3.2. Profiles of the Interviewed Respondents

Table 2: Result showing the percentage demographic features of the interviewed respondents

	sex		Age	Marital status		
	Male	Female		married	Single	other
Highlands (%)	62	38	18 & Above	70	30	-
Mid lands (%)	60	40	18 & Above	90	10	-
Lowlands (%)	70	30	18 & Above	100	-	-
Average (%)	64	36		86.6	13.4	-

As indicated in the above table 2, on average 64 percent of the interviewed respondents is male while the rest 36 percent is female respondents. On the other hand, the age of all the interviewed respondents is 18 years and above. With respect to the marital status, on average around 86.6 percent of the respondents are married while the other 13.4 are percent singles.

Table 3: Interview result showing the percentages of Educational Status of the respondents

	Educational status				
	illiterate	Primary school	Secondary school	College level	graduate
Highlands (%)	14	57	28	0	0
Midlands (%)	43	28	16	17	0
Lowlands (%)	33	67	0	0	0
Average (%)	30	51	15	6	

As shown in the above table 3, on average around 51 percent of the respondents has basic education while small percentages of the respondents (15) are second dary school. Respondents that reach college level are only 6 percent. On the other hand, on average around 30 percent of the respondents have no education or illiterate.

3.3. Trends of Drought in North Shoa Zone

Even though the frequency and extent of feeling the impact varies, prolonged drought and late coming/delay in the onset of rain and early stop of rain before crop maturation, and erratic and low precipitation are recorded in the mind of the respondents. According to the information obtained during the interview from elders' households, before 1960 and 1970s, both the belg and summer rain was well known and fully available in the zone. However, this trend was not seen from 1983 onwards except in some few highland areas. Even the summer rain has not occurred on time despite variation between and among the years. This means even if the occurrence of drought varies between or among years, there was a general decline of rainfall from year to year.

The relatively recent major drought and rain delay events that hits(affects) the zone and marked in the minds of respondents interviewed were 1983-84,1990-91, 1993-94, 2000-2001, 2007-2008. Most mid and lowland respondents perceived the 2007/2008 prolonged drought (9 months drought spell) as the most devastating drought they felt in their life time. The interviewed households also perceived the overall increasing trends of temperature and downward trends of rainfall in the zone. The interviewed held with key informants (officials)

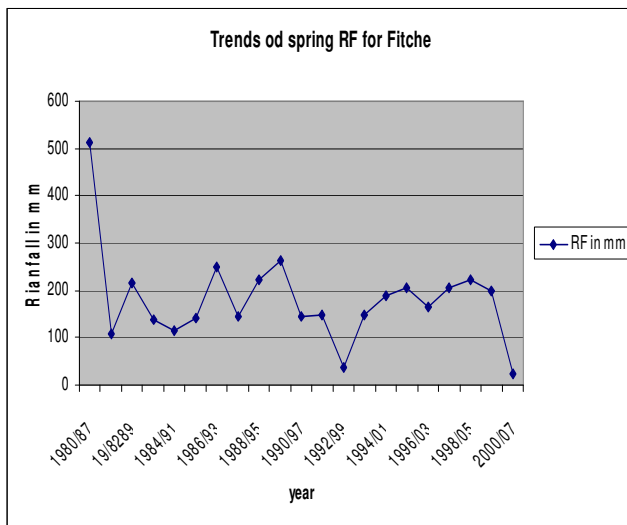
confirmed the above mentioned realities and the challenges. However, according to most respondents, the challenges are severe and more frequent in lowlands.

The annual and quarterly available meteorological data for the three stations namely Fiche (1987-2007), G/Guracha(1980-2006) and Gundo Meskel(1982/89-1999/2006) are presented on the following graphs. The trends of rainfall for each station shows a kind of fluctuation (ups and down) between and among the years. This means it is not continuously increasing or continuously declining from year to year rather shows ups and down. It also supports the information collected from the household perception during interview even if there has been wrong report in some years, which was very far from truth.

The trends of spring/belg season and September and October rainfall were briefly presented in the figure below (figure 2). These seasons are very decisive for the production of crops in the zone. This means the success or failure of crops mostly relies on the availability of rain during such seasons.

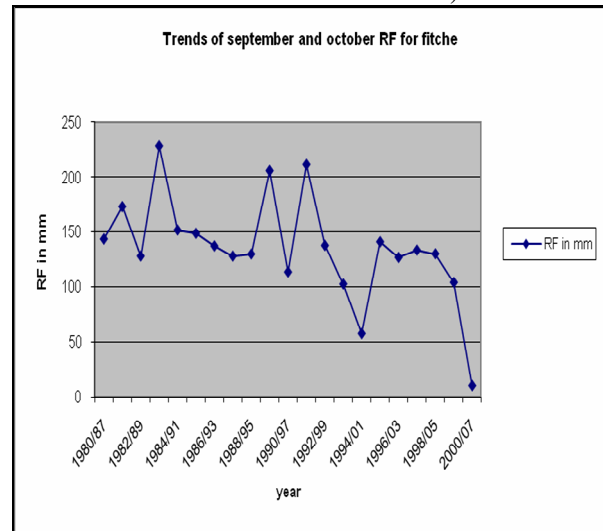
Figure 2: Showing the Trends of Rainfall and Temperature for Fitche,G/Guracha and Gundo Meskel,North Shoa Zone

Trends of Spring Rainfall for Fitche(1980/87-200/07)



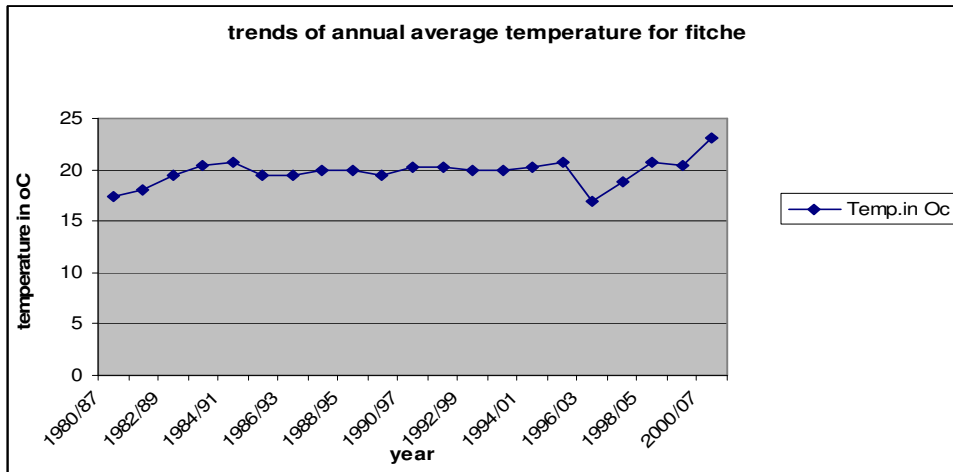
Source: National Metrological Agency

Trends of Spring Rainfall for Fitche(1980/87-200/07)



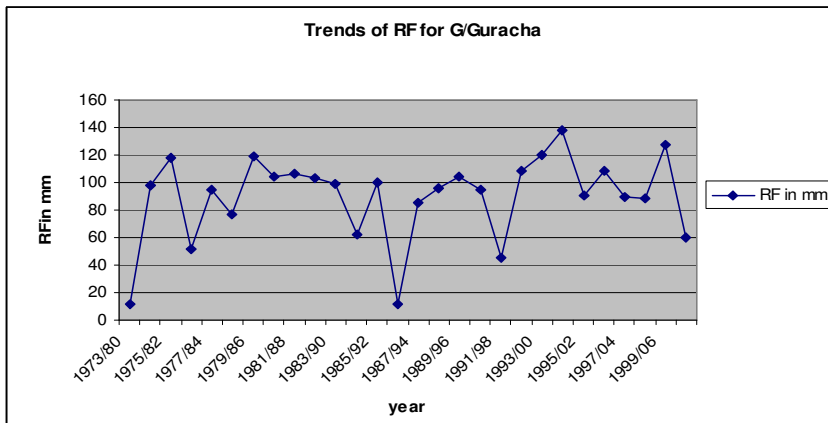
Source:National Metrological Agency

Trends of Annual average temperature for Fitcha(1980/87-2000/07)



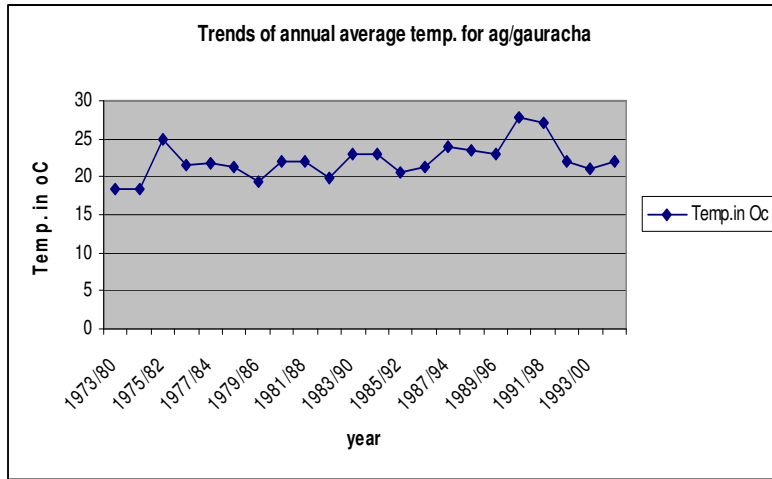
Source: National Metrological Agency

Trends of average Rainfall for G/Guracha(1973/80-1999/2006)



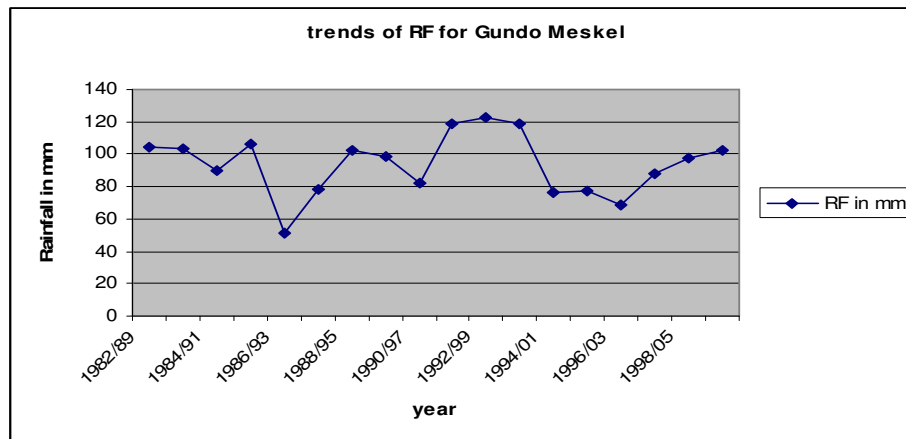
Source: National Metrological Agency

Trends of annual average temperature for G/Guracha (1973/80-1993/00)



Source: National Metrological Agency

Trends of Annual Average RF for Gundo Meskel



Source: National Metrological Agency

3.4. Impacts of Drought on Livelihoods and the Society

While the zone specific exact value of damages caused by past drought related events is scarce due to poor maintenance of data, the subjective evidences collected during respondents interview with available agricultural production data suggests that drought has been frequently imposing challenge on their livelihood and consequently affecting the societies socio-economic activity.

3.4.1. Impacts of Drought on Crop Cultivation and Livestock Rearing

Drought affects the production of crop before and after germination. During drought and late in the onset of rain, land becomes dry and difficult to plough, forage deficit leads to weakness and oxen mortality (engine of subsistent cultivation) and lack/absence of precipitation hinders seed cultivation and germination of cultivated seeds. Even weeks delay in the onset of rain found to have significant difference on the harvest and has deprivation of household's livelihoods. In kuyu woreda alone, the 2007/2008 prolonged drought spell and failure of rain before and after production has hampered cultivation of 16457 hectares of prepared land and loss of 282103 quintals of yield (North Shoa zone ARDO, 2009).The households also suggested that the situation has also created a good opportunity for weed to stay in the cropping land so that it later emerges with crops and out compete. Erratic precipitation periods have also increased an opportunity for crop pest. For instance, one of the respondent, in Dera woreda expressed bitterly the losses of or failure of crop he encountered due to shortage of rain after cultivation as follows;

In 2007, I bought improved seeds from kebeles with high costs and sowed in around three and half hectares of land. After having sown in the farm at the right time, it germinated well. However, the rain stopped at the beginning of September and the entire young seedling domed to destruction. Again, I bought another 30kgs of teff and inorganic fertilizers for 680 birr in the next year from kebeles and sowed in around two hectares of land. Unfortunately, the same disaster occurs to me. The rain that normally comes at the beginning of May shifted towards the end of June, thus aggravating the entire situation in our area.

Table 4: Land prepared to be cultivated but left uncultivated due to delay of rain in the sample woredas (2005-2008)

Selected areas	Land planned to be cultivated (in hect.)				Uncultivated land			
	2005	2006	2007	2008	2005	2006	2007	2008
Degam	39060	39060	39060	39060	8371	9241	11821	741
Kuyu	83230	83270	88392	84109	21451	22670	35614	9014
Dera	58616	58614	58616	58616	16998.6	17856	21457	6428

Source: North shoa zone and woredas ARDO (2009)

As indicated in the above table, most of the land were prepared to be cultivated in each year, but, all the planned/prepared land have not been completely cultivated due to delay in rain and oxen weaknesses. In Degam Woreda, 39060 hectares of land was planned to be cultivated but, around 8371, 9241, 11821, 741 hectares of land was left uncultivated in the specified years respectively. The same trend also experienced in Dera and Kuyu woredas. Relatively in 2008, most of planned land to cultivate was cultivated when compared with other years. Because there was no problem of rain but oxen weaknesses.

Table 5: Expected crop yields and net achievement caused due to shortage/absence of rain before and after the production in the sample woreda (2005-2008)

year	Yields in quintals	woredas					
		Degam		Kuyu		Dera	
2004/05	Expected yields	845678		1389334		751229	
	Under	38555.1	(45%)	486266.9	(35%)	247905.57	(33%)
	Net achievements	465131.9		903067.1		503323.43	
2005/06	Expected yields	937440		1440737		767098	
	Under*	43222.4	(46%)	547480.06	(38%)	260813.32	(34%)
	Net achievements*	506217.6		893256.94		50628468	
2006/07	Expected yields	1024141		1381695		783621	
	Under	450622.04	(44%)	566494.95	(40%)	282103.56	(36%)
	Net achievements	573518.96		815200.05		501517.44	
2007/08	Expected yields	1032827		2110042		1382820	
	Under	433787.34	(42%)	822916.38	(39%)	539299.8	(39%)
	Net achievements	599039.66		1287125.62		843520.2	

Source:North Shoa zone and woredas ARDO(2009)

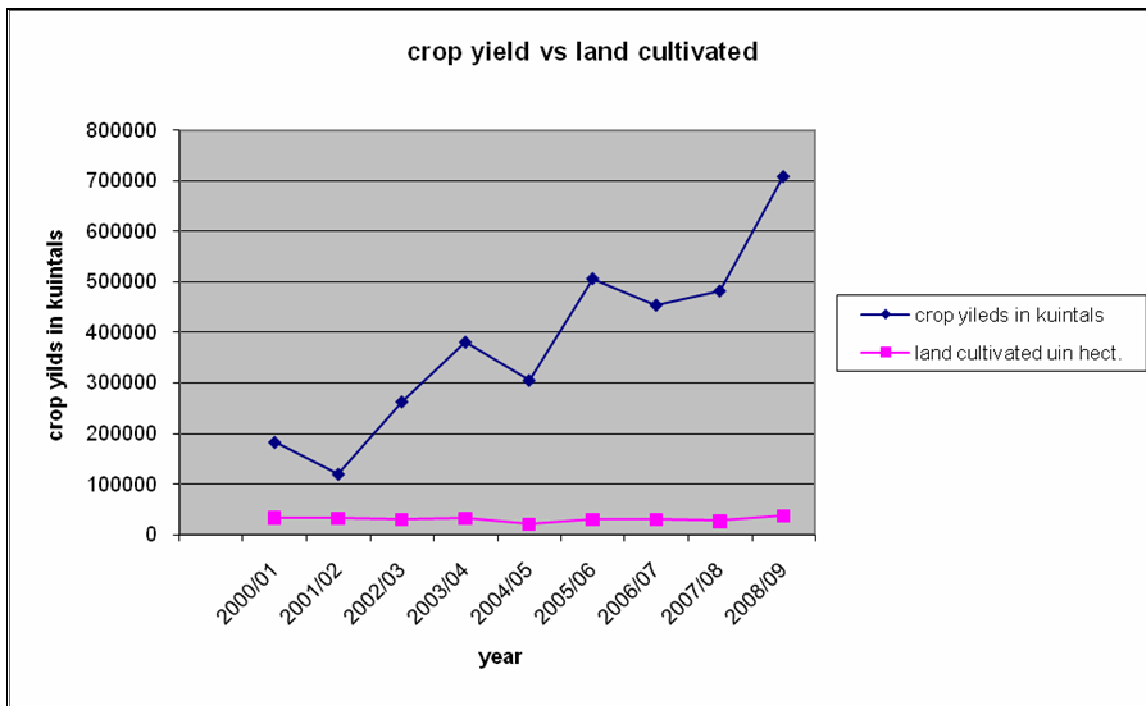
Note:

Under- means, lost crops due to non-availability of rains*

Net achievements-actual gains that the zone (woredas) achieve*

As shown in the above table 5, the production (yields) was below what was planned to be achieved in the specified woredas in all the specified years. If we take for instance, the planned yields in Degam woreda was decreased (declined) by around 45 percent, 46 percent, 44 percent, and 42 percent each specified years respectively (2004/05-2007/08). The same trend holds true in Dera and Kuyu woredas. This is due to absence/shortage of rainfall before and after seeds cultivation and colds. Especially the shortage of rain from September onwards when crop was on growth, in each year, was responsible for the production crash in each woreda.

Figure: 3 Diagram showing trends of crop yield versus land cultivated in North Shoa zone (2000/2001-2008/2009)



Source: Degam woreda ARDO,2009

The above diagram is showing the trends of crop production and land cultivated in Degam woreda over 9 years. As we can see from the diagram, there were ups and downs (fluctuations) of crop yields. This was caused when there was an event of prolonged drought and delay in the onset of rainfall or early stop of rain before crop maturity. The fluctuation in production is mainly explained from drought and early stop of rain. The shortage/absence of

rain especially from September onward is responsible for the production crash (Degam ARDO, 2009).

Drought and delay in the onset of rain led to poor grass regeneration /fodder or forage deficit, water shortage, heat stress on livestock, and consequently increased the mortality of livestock, vulnerability to diseases and physical deterioration due to long distance travel for water and pasture (North Shoa zone ARDO, 2009). The interviews held with households and officials also confirm this idea. The household interview data suggests that 25 percent per household died during the 2007/08 drought. For instance, one of the respondents in Degam woreda of Lemman Chareki kebele expressed the loss of his livestock (cattle) as follows;

In 2007/08, I lost twenty cattle due to non-availability of grass that the cattle eat and cattle diseases.

Another woman respondent also expressed the loss of her cattle by saying; I lost fifteen cattle in the same year due to fodder shortage and diseases.

According to Deresaa Abba Gidi, DA of Degam woreda of Lemman Chareki, during drought and delay in the onset of rains, it was evident that animals were more susceptible to tick infestation, pasteuriosis, anthrax, African horse sickness, sheep and goat pox, lymphangitis coccidiosis and salmonellosis. The problem becomes serious by shortage of livestock experts, clinics and drugs especially around lowland areas of the zone.

3.4.2. Impacts on the society

All the interviews similarly reported the existence of repeated serious drought impacts of course with varying degrees between years on the socio-economic activity of the society. Economically, drought forced people to sell their property because in time of repeated drought, the income they derive from crop production and livestock is declined. This makes them to be poor in the future. Drought also exposes people to the problem of famine and even death. One of the respondents in Kuyu woreda expressed his feeling of selling his livestock each year as follows;

‘Before 1992, I had many cattle and sheep. Every year, especially in years of extreme drought, I have sold one or more cattle to survive my family. Because the

income I get from the production of crop has been reduced in time of shortage of rains. Now, I am left only with one ox’.

Similarly, Mitiku Feyissa, from Kuyu woreda, also expressed the impacts of drought as follows, ‘drought affects all of us -----because our life is totally connected with livestock and crop production. We have no alternative means of income-----they are our life. This hinders us not to meet our financial requirements and agricultural inputs’.

Drought also affects people socially. All interviewees reported food deficit, malnutrition cases, educational dropouts, social conflicts, health problems susceptibility to diseases and an increase in the unemployment rate they faced in years of drought. Alemu Tessema, one of the respondents in Degam woreda expressed his feeling with regards to health problem he/his family has faced,

It is now about five years since I have faced health problem(short sight), but I did not try anything to save my self from sickness due to lack of property to be sold. Because most of my cattle have been sold in time of drought and I finished all now. One of my children also faced health problem but nothing was done to cure him till now’.

As it is understood from the above mentioned results, the impacts of drought on livelihoods were frequent and cyclic. According to the country level study by Comenetez and Caviedes (2002, cited in Abate, 2009) the successive drought in 1991-1992 and 1993-94 caused comparable affliction to that of 1980s. The damaged incurred by 1997-98 drought was also estimated to 28 million dollars(huge loss to poor country like Ethiopia) that was again followed by catastrophic flooding in 1998 that compounded food shortage and water deficit to 12.5 millions Ethiopians(WFP emergency report, 2000).

3.5. Who is more vulnerable to the impacts of drought and why?

Table 6: Interview results showing the percentage of social groups vulnerable drought

Vulnerable groups	poor	Large size family	landless	women	Children	Old & disabled	men	All groups
Highland (%)	30	7	7	18	10	18	3	3
Midland (%)	29	3	15	22	11	15	-	-
Lowland (%)	26	10	15	20	10	18	-	5
Average (%)	28	7	12	20	10	22	1	2

As we can see from the above table 6, on average 28 percent and 7 percent respondents replied poor and large size family are most vulnerable to drought impacts where as on average 12, percent 20 percent and 10 percent respondents said landless, women and children are respectively attacked most by the situation. On average respondents who suggested old and disabled people and men are vulnerable to the impacts of drought accounts 18 percent and 1 percent On the other hand only 2 percent suggested all farmers households are disproportionately and are equally vulnerable to the events. The interview held with Degam woreda and Zonal officials and experts found that poor, children, old and disabled, landless, women (divorced, women who have no husband) are most vulnerable than the other groups. The Kuyu woreda officials said, poor, landless and women are vulnerable. In Dera woreda, officials and DA said that large sized family, women, poor, old and disabled children are more vulnerable.

Poor

Though it was indicated that better-offs suffer from worries on the impacts on their properties, in most cases, their savings helps them to redeem the situation. Even usually using the events as an opportunity, the better-offs also rent land from the other groups at cheaper price and give fertilizer and seed for share cropping and give crops for higher returns. However, the poor depends on daily labour and have low income and fewer reserves to absorb to drought impacts. It was also said that the middle class farmers are affected by drought but, they respond to the impact by selling the available assets, taking credits and

leasing part of their land. So, the situation may also move the middle class farmers to the lowest level of wealth class i.e. to the poor farmers, said Gemachu, zonal natural resource expert and household interview.

Poor is also not trusted for credits due to the general perception that poor cannot afford paying it back. From all the studied areas, households were complaining about humanitarian aid corruptions (in place where aid is available) and marginalization of the poor during the aid. It was also understood that the politicians and local representatives usually over report the number of victims, the aid is distributed among all the groups and in most cases poor receive marginal amount of aid.

Vulnerability by gender

20 percent of the respondents suggested that women are more vulnerable to the impacts of drought quickly compared to 1 percent respondent for men. Vulnerability of women was explained from lack of access to property, confinement at home caring for children and family members, worries about feeding the family, poor nutritional status and long distance travel to collect water.

According to Mogos Eshetu, Agronomist from Kuyu woreda, women have dual responsibility. One is managing the house and the second responsibility is activity outside the home. Their closeness to family members and confinement at home makes them suffer the most because the men can take the breath by being away from home. The impact is intense for divorced or in case of women who have lost husbands. Because divorced or women whose husbands dead take all the responsibilities of caring household by selling local drinks, leasing land, charcoal, selling particularly, if she is landless and has no elders but more dependent, the situation becomes more difficult to manage the situation, thus she is obliged to face the socio-economic pains of the situation. In case she is old, the change is again more intense.

Vulnerability by family size

The interviewed households have family size of 1 to 8 persons per household and the overall average household size is 7 (note that around 13.4 of the r percent espondents are singles).

According to the interview held with officials and house holds, relatively large size family is most vulnerable to the impacts of drought. Because it is difficult for large size family to feed, buy clothes and send to school their children even in time of surplus and good seasons. Their assets are not much with the size of their family. If households have small size family, it is retentively easier to send their children to school, feed and buy clothes when compared with large size family (households' interview).

Children, old and disabled

Old people, disabled and children are sections of the society who are said to be unproductive and dependent. Unlike youth, old and disabled have no choice at times of drought even to migrate to areas where there are availability of jobs to pass the crisis time unless they have land to be sold on lease which helps to keep the survival of their life. Again, children are also vulnerable to the situations and their vulnerability is apparent from malnutrition cases, school dropout and poor educational achievements.

Landless and unemployed

Though, is difficult to conclude that all landless people are categorized under poor and very poor, they are mostly vulnerable first to the impacts of drought. Because they have no options that make them to pass the unwelcome time when other land owners sell/lease their own land, said, Gemachu Bekele, zonal ARDO official.

According to the zonal wealth classification data, most of the interviewed households are grouped under poor and very poor categories, farmers who are landless or nearly landless and or have few or no livestock. The average livestock for the households interviewed is 9; ranging from 0 to 27 and 39 percent of the households has 7 or less livestock. The average landholding per household interviewed is 1.4 hectares of 1 percent and, ranging from 0 to 3.5 hectares and the percentage of household with no land is 26. Despite the lack of zonal information regarding the average firm size, the average land holding per household most likely couldn't show much deviation from this result, even could be less for highland

households due to its population density. This shows that the frequent sub-division of land as an inheritance has generally led to land fragmentations where no more meaningful subdivision can take place. Landless households can reach as high as 40 percent in kebeles of some woredas(North Shoa zone ARDO,2009).

In addition, the vulnerability of youth is explained due lack of land and absence of employment opportunity in the zone. Though old have inherited land to their offspring, they are relatively better in land holding and better immunity to cope with climatic shocks in this aspect, where as youth are generally poor because of landless and unemployment. And it is due to this reasons that youth migrate to different areas of the region in time of shocks. Further, the fact that 2 percent respondent suggested all households are equally vulnerable in this study can also be partly explained by the lack of flexibility for multiple income sources during droughts. To alleviate the problem of landless, the government of Ethiopia is undergoing resettlement program to freely available communal land and to division of government's land (Gemachu Bekele, zonal ARDO officials).

3.6. Major constraints Exacerbating Vulnerability

There are a number of constraints that aggravate vulnerability in the zone. Some of the challenges found during the study were;

- ❖ Land fertility is declining; no fallowing of land and there is only limited use of animal manure, also use of crop residues and weed as cattle fodder.
- ❖ Unavailability and inability of most farmers to afford agricultural inputs, fertilizer and selected crop variety (on average 95 percent respondents). This means an increasing dependence on extensive chemical fertilizers (DAP and Urea) and poor withstand of dieses of improved seed. Most households and officials interviewed repeatedly reported that the fertilizer and selected variety of crops distributed by the government is not taking into consideration the capacity of all farmers. Even the available fertilizer and selected variety are not supplied at the needed time except in the previous year (households' interview). In 2008, the price of inorganic fertilizer was 980birr per quintal which twice was the price before three or four years (households and officials interview). Though it is clear that

agricultural input plays a key role in increasing productivity under increasing land scarcity and resource degradation, the current price haul is constraining farmers from using fertilizer.

- ❖ Lack of education is one of the basic reasons that worsen vulnerability in the zone (household and officials interviewed). Because education helps people to understand the importance of saving for bad weather..
- ❖ A shortage of plough oxen and not owning livestock contributes to the low levels of crop production in the area. However, grazing land short-supply and cattle are raised using a” zero grazing system.” Thus, increase in livestock is an increase in environmental stress.
- ❖ Absence of modern irrigation is another constraint that aggravates vulnerability in the zone. Even the traditional irrigation system is not properly utilized. It creates conflicts between and among people since it is very scarce. Household also repeatedly report the absence of clean water coverage that affect their health even if they have better river water endowment especially in high lands.
- ❖ Lack of alternative sources of income to the household other than agricultural activity.
- ❖ Shortage/absence of credits and with its existing bottlenecks.
- ❖ Cultural practices of the community lead to extravagance in case of weddings, deaths and gender biases despite its social value.
- ❖ Migration takes place in every year in search for causal jobs leads to the reduction in the productive labour force in the zone.

3.7. Adaptation/ coping mechanisms

1.7.1. Local adaptation strategies to Drought

Table 7: Interview result showing the percentage of major adaptation strategies used in North Shoa zone

Coping strategies	savings	migration	credits	Selling own asset	On farm and of farm diversification
Highland (%)	20	12	15	26	27
Mid land (%)	26	21	21	13	19
Lowland (%)	17	28	14	20	21
Average (%)	21	20	17	20	22

As we can see from the table7 above, on average 21 percent of the respondents, 20 percent in highland, 26 percent in midlands and 17 i percent n lowland use savings as their major coping strategies. On average 20 of percent the respondents, 12 percent in highlands, 21 percent in midlands and 28 percent in lowlands suggested migration as their main adaptation strategy. Credits from informal and formal sectors are used on average by 17 percent respondents. Selling own assets (either cattle or land selling on lease) is used by on average 20 percent of the respondents. On farm and off-farm diversification also helps farmers to retain their assets or to withstand drought shocks (on average 22 percent of the respondents, 27 in percent highlands, 19 in percent midlands and 21 in percent lowlands).

Saving- respondent use the term saving in two ways:-during impact saving and pre-impact saving. During impact saving is using less amount of available resource in time of drought such as eating less food, reducing purchases. While pre-impact saving household keep sufficient assets crop, forage, livestock, money or other form of assets) that help them to bridge hardship times. According to respondents, after facing perilous income and food deficit in recent drought and rainfall delays, pre-impact saving became their main strategy. In addition to managing household food consumption, to pay-off expenses and to fulfill household financial requirement, the households are selling livestock instead of crop (who own livestock). However, according to Gemachu Bekele, zonal natural resource expert and

Deressa Abba Gidi, DA at Degam Woreda, in mid and low lands, the adaptation/coping mechanisms are still very poor. Households sell what they produce during the harvest season and become victims of the shocks. Because there is no culture of saving in these area.

Migration and relatives-It is known that the people of North Shoa zone migrate to different areas of the region such as Bale, Chore, Harar, Addis Ababa, and the like in time of drought and other problems and they returned back when the time of problem passed away. As mentioned before, there is also scarcity of land in the zone and most of the people are landless. This problem together with the repeated occurrence of drought in the zone makes them to migrate to different areas of the region (interview with officials of zonal DPPC). It is due to this reasons that people usually said, 'there is no area where there is no people of North Shoa in the region even outside the region'. There is also a long standing of social interconnectedness that plays significant role during crisis, which promote mobility and resource share and exchange during security problem. One of the respondents in Degam Woreda said,

'In 2002, most of the people in Kuyu Woreda migrated to our woreda together with all their family and their livestock due to prolonged drought and they returned back after resilience'.

Credits-credit from better-offs informal social organizations, youth and women associations (recently) and government institutions are crucial during the crisis. But, society is repeatedly criticizing money provided by government due to different reasons. For one thing, it is given without providing awareness on how to use it and for what purpose. Second, it is filled with nepotism. Traditional civil society organizations such as Idir and Equib, supporting members during emergencies, also provide credits during crisis.

On-farm and off-farm diversification

Diversification coping strategies such as on-land diversification is not well known and experienced in the zone for along period of time. However, currently the study in mid land and lowland areas revealed significant shift toward on-farm diversification practices like on-land life diversification, where farmers grew different types of crops on land which have

different drought resistant capacity. Wood sell is also taken as coping strategy especially in lowland areas of the zone.

On the other hand, in spite of its limited employment opportunity and its low income return, off-farm and non-farm activity help households to retain or to withstand drought crisis. Informal trades like the generation of income by women through producing local drinks such as areke and tella is also the strategy. Poor and landless also make earning from daily labour on better-off farmers' land, construction activities, equine carts and on small scale businesses.

3.7.2. Institutional response strategies provided in the zone

According interviews held with officials, the ARDO together with DPPC and DA is providing for the society on how to develop the culture of saving, use of Broad Bed Maker Technology (BBMT), advising to Scale up traditional water bond to modern water harvesting technology, providing agricultural inputs in time of drought. There also time when even oxen and clothes are given for extremely affected society due prolonged drought and flooding (interview with ARDO and DPPC officials). However, Even if there was a good start, most respondents explained all these services are at its early stage and farmers' understanding is very low. Especially the adoption of oxen-drawn BBMT was limited to due to its heaviness, price unaffordability, unavailability and lack of awareness. BBMT impact assessment study in oromiya and Amhara region has also found disappointing households welfare, improvements among users of technology, insufficient training, underestimated human labour requirements and oxen drought power, price unaffordability and consequently the land cultivated by BBMT is 1% of the estimated 7.6 million hectares of vertisol soil in Ethiopian highlands (Rutherford, 2008 cited in Abate, 2009). Officials also reported as community was repeatedly advised on how to use irrigation system. However, community water harvesting was also challenged by less precipitation, water seepage and quality deterioration.

Emergency aid and PSNP

It is known that during emergencies government, NGOs and civil society organizations provide emergency food, seed varieties and health services for affected people. However, the information gathered from the respondents revealed that there are no NGOs and civil society organizations that are involved/engaged in such activities in the zone. Even the role of government is very low in saving people from the crisis. Most people repeatedly reported that there is nothing the government provides for them when they are repeatedly affected by drought.

On the other hand, different development program such as the safety net program, which is an extension of “food for work” program of Derge régime, is practiced by Ethiopian government to help extremely affected society during crisis. And the program has two components, public work and direct support. However, with the exception of few Woredas, most of the Woreda in North Shoa zone has no safetynet. This indicates that the involvement of government and other institutions in saving peoples’ life from disaster in the zone is very low.

In case of public work, money is given after the individuals have participated in community development work such as water harvesting, road construction, spit irrigation, soil water conservation and other development activities (given for 80%). Direct support is given for children who have no family, disabled and old people without any need to works (20%). However, it is limited to few households in kuyu Woreda and other woredas which have safety nets (Norh shoa zone ARDO, 2009). In principle, the beneficiary should be ‘poor of the poor’ but there still complaint on inclusion of non-poor large family size households that get disproportionate amount of aid or money compared to targeted poor households. The program is also challenged by lack of community’s eagerness to participate in development work, insufficiency of the aid and fruitlessness of the activities or their negative consequences (harvested water caused malaria emergency, quality deterioration and water seepage (households and officials interview).

3.8. General Discussion

According to this study of drought impact on livelihood, vulnerability and coping strategies in North Shoa zone, there are increasing trends of drought in the zone even if the degree of impacts vary from one year to another. This results in aggravating the impacts on crop production and livestock rearing. However, there are local (indigenous) response strategies that are used to minimize the impacts of drought such as saving, migration, credits, selling own assets (who own) and on-farm and of-farm diversification. But, all these coping strategies are not equally known and practiced in the zone. And their importance is not equally understood by the farmers. There are also institutional coping strategies such as emergency aid, credit services, safety net (even if it is recent phenomenon and is not well strong), awareness rising on saving and use of technology. Though the coping mechanisms are not sufficient to address the challenges, all societies are vulnerable to the events, and vulnerability is more acute on the poor, landless and unemployed, children, and women, old and disabled and large sized households. Wedded with landlessness and unemployment, water scarcity, lack of education, unaffordability and on time unavailability of fertilizers and selected varieties of seed or agricultural inputs, and other stressors, drought is more likely to gamble the socio-economic activities and aggravate the society's vulnerability.

The respondents' perception and meteorological data show that the trend of agro-ecology is gearing towards hotter and humid environment. However, the degree of dryness is varying between and among years. A country level study performed by Tilahun (2006) has found the declining trends in annual rainfall since 1060s in Ethiopia (cited in A bate, 2009).

The increasing trend of impacts of delay in the onset of rain, prolonged drought and the impacts on livelihood observed in North shoa zone are also prevalent in most developing countries particularly, where agriculture is subsistent and crops are gathered by traditional means e.g. Bangladesh (Harun-ur Rashid and Islam, 2007). The land preparation obstruction during prolonged drought or rain delay worsen due to traditional way of farming, land dry up and increased mortality and weaknesses of oxen to plough the land. The seed cultivation and germination is also hindered due the absence/shortage of irrigation technology. According to

o'Brien et al., (2004), woredas with higher irrigation rates are expected to have a higher capacity to adapt to drought challenges and other economic shocks.

Yet, the examination of the existing coping mechanisms showed that even the marginal groups of the society were found using one or more strategies to enhance their resistance against crisis. Saving of livestock, food crop and feed have been dominated and it is more likely to play significant role to adapt with disaster. Coping strategies such as on-land diversification is not well practiced in the zone and its importance is not feasible. Though, it is currently challenged, land use change and frequent droughts, migration is a very common practices in east Africa and Asia (Ahmed et al., 2002). The significance of social interconnectedness and informal associations seen in North shoa zone is also prevalent in other parts of Ethiopia and other countries of the world. The study by Fraser (2007) depicted that the worst affected households in Ethiopia during the 1983-84 drought were those from newly built communities in Northern provinces of wollo and Tigray who were far away from their relatives. Similarly, findings have been shown from Vietnam where informal but illegal credit systems and social associations have played a pivotal role in sustaining kinship and lineage ties which are necessary for security in times of crisis (Adger, 1999).

However, the currently available coping mechanisms are not sufficient, particularly for lowlands and all societies were vulnerable to different socio-economic challenges. Vulnerability was further aggravated by other internal and external stressors. It seems surprising that 95% of households interviewed suggested that unavailability of fertilizer and selected crop variety, water shortage and landlessness /unemployment are their overarching stressors that aggravate vulnerability to disaster. Obviously, like other poor developing countries, there are many other challenges such as transportation, light, telecommunication and other health center. However, this result shows that the first three stressors serious and are priorities for the livelihood of the households.

The recent fertilizer price increase is the first top challenge for farmer households in the zone. This shows that small-holder farmers are strongly vulnerable to the international and national increase in fertilizer price. Similar to this study, Denning et al., (2009) have shown

that low agricultural production caused by less agricultural inputs and frequent trends of drought has deteriorated livelihood in Malawi. Similarly, Hargrove (2008) have conformed that the recent unprecedented rise in fertilizer prices in the international market, more than 100% in 2007, affects poor farmers in developing countries, particularly farmers in Sub-Saharan Africa. Hargrove (2008) also indicated the fertilizer used in Africa is still the world's lowest (about 8 kg per hectare); the lack of fertilizer worsen hunger and poverty in the continent. The study in other countries like Asia and Latin America suggests 50% to 70% of the food crop production increase within two decades was due top the use of inorganic fertilizer(Narayana and Parikh,1987 ;Viyas,1993 cited in Mwangi,1996).

The absence of employment opportunity and landlessness is also one of the greatest challenges for North shoa zone and is an indicator for indiscriminate vulnerability of majority of the society. One of the particular interests that show frustrating the livelihood in this study is the vulnerability of youth compared to elders, which was explained by the difference in landholding where most elders are better in landholding and youth are landless and unemployed. The response that shows all societies are equally vulnerable can also partly confirm the exacerbating vulnerability of all societies to drought due to the stressors. In contrary to this study and the mainstream economic postulation that shows the negative relationship between landlessness and economic development, hence vulnerability, one study in Bangladesh has found a positive relationship landlessness and economic growth. The study has shown that the failure in income due landlessness forces people to migrate to for better incomes in the city (Rahman and Manprasert, 2006).

In Ethiopia, flexibility to multiple income sources is limited to due to limited employment opportunity and its low return (Bigsten et al., 2005). More importantly, agriculture accounts for the majority of the total national Labour force. Thus, the exposure of agriculture to drought is, particularly for poor and landless livelihood, double exposure as they have few assets to absorb the shocks and as the employment opportunity is further depreciates with the events. O'Brien et al., (2004) has found that landless Indian farmers are poor and have little security and "in time of agricultural distress, landless laborers are the first to lose their income".

In addition to poor, landless and unemployed, vulnerability is also acute on children, women, elders and disabled and large size family households. Children's vulnerability is attributed to their susceptibility to food shortage and diseases and responsibility to look after livestock and water collection. The family's status and household size also determine the household's affordability to feed and/ or send a child to school, school dropouts and academic achievements. On the other hand, women's vulnerability compared to men is attributed to illiteracy, less accessibility and entitlement to resources, cultural or gender division of labor, poor agricultural status. Vulnerability is intense on divorced, women headed households and on women who has no husband due to their responsibility for both household and outside activities. Study in drought prone areas of Botswana has also shown the more vulnerability of women and female headed households due to more dependence rate, less access and entitlement to resources (Hassan, n.d). According to cutter (1995), the lack of equity makes both children and women to bear and continue to bear the impact of drought.

The study in North Shoa zone also shows, the increasing resource scarcity and the more dependence ratio exacerbated the vulnerability of large size households to crisis. This is in consistent with Vincent (2004) who suggested the positive relationship between dependence ratio and vulnerability crisis. The high population growth rate in this study is also an indicator of continuous Malthusian population trap and the disappointing progress in the family planning of the country. The population increase, unemployment and over dependence on natural resource base as a coping strategy have significant implication on the future vulnerability of the society.

The high livestock mortality, high malnutrition cases, livestock price failure, rising food crop price, school dropouts and food shortage shown in this study also partly demonstrates the slow and the insufficiency of institutional intervention in early warning and identification of vulnerable groups. The humanitarian aid corruption cases and the failure to address vulnerable groups in North shoa zone was also evident from geographic bias at the country level where 755 of the needy Ethiopian households received no aid at all due to poor proxy

indicators, institutional rigidity and consequent generous allocation of food aid to historically drought-prone areas by ignoring others or improving of past ignorance (Devereux, 2000).

Currently, government institutions are engaged in different development programs. However, there are complaints from government officials that the existence of societal hindrances such as failure of adopting technology, lack of eagerness to participate in development programs, the programs' unpopularity and societies failure to make lesson from advices and previous impacts. The researcher advocate the in-depth study of uncovering the societal barriers, he first suggest to ask the question, how much the current institutional measures has escaped the traditional to-down approach orthodoxies in considering holistic, coordinated, research based, long-term and other effective sustainability approaches? After all are the programs really sustainable?

The researcher argues that the failure to adoption of BBMT (due to its heaviness and cost), fruitlessness of safety net programs in woredas where there is safety net programs), lack of awareness, poor implementations of institutional advices, water quality deterioration and seepage and emergence of malaria after harvesting, and the unpopularity of the development program reflects the predominance of previous top-down approach. After all, these challenges are equivalent to the challenges faced by ambitious and appreciated but, failed food for work program of the Derge regime. According to Hopen (1995) the Derg's food for work program has failed due to lack of on-farm studies or environmental effects, the program's top-down approach; late food delivery, limited coverage of food insecure communities and the unpopularity of the programs.

3.9. Conclusions

Based on the data gathered during the interview together with information obtained from NMA, the impact of drought in North Shoa Zone has been increasing and rainfall is declining from year to year. However, the degree of dryness and its impact on livelihoods is not similar in all years.

Almost all respondents repeatedly reported that drought negatively affects their livelihoods and their asset has been reducing from time to time as a result. Especially, the impact of drought on crop production and livestock rearing is highly observable in the zone.

All society in the zone is not equally vulnerable to impacts of drought and vulnerability is intense on the poor, landless, women, children, old and disabled. There are a number of challenges that aggravates vulnerability in the zone. The main constraints that exacerbate vulnerability in the zone include unavailability and inability of most farmers to afford agricultural inputs, fertilizer and selected crop variety. Absence of modern irrigation system is also raised as the major constraint that aggravates vulnerability in the zone. Further, most respondents repeatedly raised lack of education as one of the basic reasons that aggravates vulnerability in the zone.

There are number local coping mechanisms that help people to cope up with the impacts of drought in the zone. These includes savings, migration, credits (especially from better-offs), on farm and off farm diversification. However, these adaptation mechanisms are not equally important and are not sufficient to reduce the impacts of drought on crop production and livestock rearing. The study also shows a weak institutional response strategies related to drought impacts provided in the zone.

Chapter Four

4. Summary of the Findings, Conclusions and Recommendations

4.1. Summary of the Findings

The data obtained from different sources and during the interview (especially with elders' households) showed that before 1960s and 1970s, the belg and summer rain was fully available in North Shoa Zone. However, this condition is not seen today and there is a general decline of rainfall in the zone from time to time. The droughts of the 1983-84, 991-92, 2000-2001, 2007-2008 were recorded in the minds of most respondents. The information obtained from NMA also supports the respondents perception.

Drought affects the livelihoods of the society directly or indirectly. It affects the production of crop before and after germination. During drought and late in the onset of rain, land becomes dry and difficult to plough, forage deficit leads to weakness and oxen mortality and lack/absence of rainfall hinders seed cultivation and germination of cultivated seeds. And this situation has been happening in North Shoa Zone. For instance, in Kuyu Woreda, the 2007/08 prolonged drought spell and failure of rain before and after production hampered cultivation of 16457 hectares of prepared land and loss of 282103 quintals of yields. When the production of crop (main income of the farmers) is destroyed, farmers are forced to sell their livestock and lands (who own land). And others are forced to migrate. This situation makes the farmers to be poor subsequently.

The study also shows that even if all society is vulnerable to the impacts of drought, vulnerability is more intense on the poor, large size family, landless, women, children, old and disabled. Because people have no equal adaptation capacity and their adaptation capacity depends on their assets, social interconnectedness and other factors. There are a number of challenges that aggravates vulnerability in the zone. These include, the decline in the fertility of land, unavailability and inability of most farmers to afford agricultural inputs, fertilizer and selected variety of crop and lack of education

The people of North Shoa Zone use diverse adaptation mechanisms to cope up with impacts of drought. And the adaptation strategies can be the society's original or provided by the

exterior bodies. Some of the indigenous adaptation mechanisms available in North Shoa Zone include savings, mobility, credits, selling own assets, on-farm and off-farm diversification. But, all these coping strategies are not equally important and practiced in the zone. ARDO and DPPC are government institutions that are helping the society during/after drought in the zone even if it is very recent and at its early stage and the institutional coping strategies provided in the zone is very weak.

4.2. Conclusions

The study shows that the trend of drought in North Shoa Zone is increasing from year to year even if its degree is varying between and among the years. This increasing trend of drought has been highly affecting the zone's livelihoods and aggravates the vulnerability to different socio-economic activities of the society. Especially, the shortage/absence of rainfall before and after production, delay in the onset of rain affects the farmers' livelihood such as crop cultivation and livestock rearing, which is grave concern for all the societies in the zone.

The local coping/adaptation mechanisms that available in the zone to reduce the impacts of drought includes, saving, migration, credits, selling own assets and on-farm and off-farm diversifications. However, all these coping strategies are not equally important and well experienced in the zone. For instance, diversification (especially on-land diversification) is not well practiced in the zone. Even the existing local/indigenous strategies are not adequate for reducing the impacts of drought.

One of the reasons that these local/indigenous strategies are inadequate is the fact that they largely operated without any formal government support or facilitation. Since only minorities have access to formal employment and market-based options, most people rely on informal economic activities. The local knowledge, networks, customary institutions and local biodiversity that are used for coping are often ignored by the formal financial, technological and institutional framework in the zone countries. Furthermore, policies sometimes inadvertently undermine local coping capacity by restricting flexibility.

There are no strong institutional response strategies that have been provided in the zone. With the exception of government institution, there is no other institutions that are involved/engaged in such activities in the zone. Even the involvement of government is very low and at its early stage. This may be due to low initiation of government in encouraging other institutions (NGOs, civil societies and the like) to be involved in disaster prevention in the zone.

Stressors that are enhancing societal vulnerability to the disasters in the zone includes, land scarcity and unemployment, unaffordability and on time unavailability of agricultural inputs such as fertilizers and selected varieties of crops, lack of education, unavailability of modern irrigation system/water harvesting and the like. Though, all farmers are vulnerable to drought, vulnerability is heightened on the poor, landless, children, and women, old and disabled and large family size.

4.2. Recommendations

Based on the findings and conclusions, the following recommendations are forwarded; With the ever increasing weather unreliability, strong dependence on rainfall sensitive sectors and continued water deficit, the involvement of different institutions on early warning and robust contingency planning is crucial. So, the government of Ethiopia must increase its role and encourage other institutions to be involved in such activities.

There is no modern irrigation system that helps the people in time of drought in Ethiopia in general and in the zone in particular. Even the traditional irrigation is not properly utilized. So, much is expected from the government and other concerned institutions in providing awareness to scale up the traditional water harvesting and to expand modern irrigation system. Because woredas with higher irrigation rates are expected to have a higher capacity to adapt to drought challenges and other economic shocks.

The availability of fertilizers and selected varieties of crops on time is important under land scarcity to reduce social vulnerability. This can be made by using pro-poor “smart” agricultural input subsidies work, where equal access to the equal amount of input and increases fertilizer use by poor. Similar action should be undertaken by Ethiopian

government general and in North Shoa zone in particular to minimize social vulnerability to drought crisis.

There should also be an effort to invest in agricultural research on the use of new crop varieties and livestock species that are more tolerant to drought.

Much work is needed to alleviate landlessness and unemployment by enhancing the micro-financing efficiency, creating employment opportunities and sustainable and well studied resettlement programs.

Sustainable on-land diversification should be promoted and well practiced to cope with the future most likely impacts of drought in the zone. On the other hand, coping mechanisms such as productive labour migration to other areas should be minimized in the zone. Because it's negative side is more than its positive side

Preparing long-term adaptation plans based on the sharing of best practices through community participation, civil society engagement, and the participation of academic and research institutions, with regular monitoring to identify promising practices for scaling up.

Building on what farmers are already doing to adapt to drought and the farmers' coping strategies should be formalized. And investigating these practices further for their sustainability and impact on poverty and inequality, and potential for replication or enhancement.

Humanitarian/development organizations, private sector and community organizations and leaders should engage in improving drought awareness and knowledge management in the zone.

Promotion of development programs and addressing vulnerable groups through development of better proxy indicators of societal vulnerability, like the way vulnerable groups identified in this study, addressing them from short and long term perspectives, e.g., institutional policy intervention in market during the impacts, post-impact recovery strategies, discouraging land use change.

References

Adger, W.N. et al.(2003). Adaptation to drought in developing world. *Progress in Development Studies*, 3(3), 179.

Adgolign, T.B. (2006) Theoretical and Practical Considerations for the Selection of Water Harvesting Techniques: Case Study of Sasiga District of Oromiya, Ethiopia. *UDESCO-IHE Institute for Water Education*.

Ahmed, A.G.M. et al. (2002) Post-Drought recovery strategies among the pastoral households in the horn of Africa: A review. *Development Research Report Series no. 3*.

Bewket W. (2003) Towards integrated watershed management in highland Ethiopia: the Chemoga watershed case study.

Bigsten, A., Kebede, B. & Shimeles, A. (2005). *Poverty, income distribution and labour markets in Ethiopia*, Nordic Africa Institute.

Brooks, N. (2003_). Vulnerability, risk and adaptation: A conceptual framework. *Tyndall Centre, University of East Anglia*.

Bryman, A. (2008). *Social research methods*, Oxford New York.

Carney D. (1998). *Sustainable Rural Livelihoods*, Department for international Development, London.

Collier, P., Conway, G. & Venables, T. (2008.) Climate change and Africa. *Oxford Review of Economic Policy*, 24(2), 337.

CSA1 (2008). Summary and Statistical Report of the 2007 Population and Housing Census Results. Available at:www.cia.gov/library/publications/the-world-factbook/print/et.html.

CSA2 (2008). *FDRE CSA Agricultural Sample Survey: Report on area and production of Belg season crops for Private peasant holding*, Addis Ababa.

CSA4 (2008). *FDRE CSA Agricultural Sample Survey: Report on Farm Management Practice*, Addis Ababa.

Cutter, S.L.(1995). The forgotten casualties: women, children, and environmental change. *Global environmental change*, 5(3), 181-194.

Comenetz, J. & Caviedes, C. (2002_). Climate variability, political crises, and historical population displacements in Ethiopia. *Global Environmental Change B: Environmental Hazards*, 4(4), 113-127.

- Degam Woreda ARDO (2010). *Degam annual crop production report*, Degam, Ethiopia.
- Deressa, T., Hassan, R.M. & Ringler, C.(2008). Measuring Ethiopian Farmers' Vulnerability to Climate Change across Regional States. *International Food Policy Institute*
- Devereux, S. (2000). Food Insecurity in Ethiopia. In a *DFID Ethiopia Seminar, London*
- Ellis, F. (2000). *Rural livelihoods and diversity in developing countries*, Oxford University Press.
- Esikuri, E. E. (2005). Mitigating Drought - Long Term Planning to Reduce Vulnerability. Environment Strategy Notes, No. 13. Washington, D.C.
- FAO (1998). Food supply situation and crop prospects in Sub-Saharan Africa. Available at: <http://www.fao.org/docrep/004/W8261E/w8261e00.htm> (Accessed December 17, 2010)
- FDRE (2006). Productive Safety Net Program: Program Implementation Manual, Government of the Federal Democratic Republic of Ethiopia; Ministry of Agriculture and Rural Development
- Fraser, E.D.G. (2007). Travelling in antique lands: using past famines to develop an adaptability/resilience framework to identify food systems vulnerable to climate change. *Climatic Change*, 83(4), 495-514.
- Gautam, M. (2006). Managing Drought in Sub-Saharan Africa: Policy Perspectives. Drought: Economic Consequences and Policies for Mitigation Washington, D. C., World Bank.
- Goldstone, J. (2007). Flash Points and Tipping Points: Security Implications of Global Population Changes, 2005-2025. *Woodrow Wilson Center, Washington, DC*, 26.
- Hargrove, T.(2008). *World fertilizer prices soar as food and fuel economies merge. IFDC Report. 33*,
- Harun-ur-Rashid, M. & Islam, M.S. (2007). Adaptation to drought for Sustainable Development of Bangladesh Agriculture.
- Hoben, A. (1995). Paradigms and politics: the cultural construction of environmental policy in Ethiopia. *World Development*, 23(6), 1007-1021.
- Hoddinott, J. (1999). Targeting: Principles and Practice, Technical Guide No. 9, International Food Policy Research Institute, Washington, D.C.

IWMI (2004). Assessment and Mitigation of Droughts in South-West Asia: Issues and Prospects. Colombo, Sri Lanka.

James Verdin (2007) Drought Mapping, Assessment and Monitoring -2nd Asian Ministerial Conference on Disaster Risk Reduction, New Delhi

McCarthy, J.J. (2001). *Climate change 2001: impacts, adaptation, and vulnerability: contribution of Working Group II to the third assessment report of the Intergovernmental Panel on Climate Change*, Cambridge University Press.

Morton, J.F.(2007). The impact of climate change on smallholder and subsistence agriculture. *Proceedings of the Rational Academy of Sciences*, 104(50).

Mulat, D. (2004). Hydrological Variability in Ethiopia: Its Impact and Some Strategic Considerations. Background Paper For Ethiopia Water Resources Assistance Strategy Of The World Bank., Addis Ababa.

Ngaira, J.K.W., (2007). Impact of drought on agriculture in Africa. By *Scientific Research and Essays*, 2(7), 238-243.

NMSA(1996). *Assessment of Drought in Ethiopia: DMSA SAREC project*, Addis Ababa.

North Shoa Zone ARDO (2010), *Socio-economic profile of North Shoa zone*, Fitcha, Ethiopia.

NWS (208) what is drought? Public fact sheet <http://droughtreporter.unl.edu/>(accessed on January 5/2010)

Pulhin, J. et al. (2006.) Vulnerability of communities to climate variability and extremes: the Pantabangan-Carranglan watershed in the Philippines. *AIACC Working Paper*, 44.

Roossi, G. (2003). Requisites for a Drought Watch system. Tools for Drought Mitigation in Mediterranean Region. Dordrecht, Kluwer Academic Publishing, Netherlands: pp147

Rutherford, A.S., I.I.A. (2008). The role of the broad bed maker plough in Ethiopian farming systems: An ex post impact assessment study.

Sara (2009). Mitigating Drought: Policy Impact Evaluation A Case of Tigray Region, Ethiopia.

Subbarao, K. and J. Smith (2003). Safety nets versus relief nets: Toward a medium term safety net strategy for Ethiopia. Mimeo. Washington, D.C.: World Bank.

Thornton, P.K. et al.(2006). Mapping climate vulnerability and poverty in Africa. *Report to the Department for International Development. The International Livestock Research Institute (ILRI), Dairobi, Kenya.*

UNDP (2002). World Development Report, Oxford University Press.

Vincent, K.(2004)). Creating an index of social vulnerability to drought for Africa. *Tyndall Center for Climate Change Research. Working Paper, 56, 41*

WFP Emergency Report (2003). Ethiopia | WFP | United Nations World Food Programme – Fighting Hunger Worldwide. Available at: <http://www.wfp.org/countries/ethiopia> (Accessed december 20,/2010).

Wilhite, D. A. and M. Buchanan-Smith (2005). "Drought as hazard: Understanding the natural and social context." *Drought and water crises: science, technology, and management issues: 3–29.*

World Bank (2004). Project Appraisal Document for a Productive Safety Net Project. Report No. 29767-ET. Washington, D.C.

Appendix- I

Interview Questions: English Version

Dear respondents,

I am undertaking a study on THE IMPACTS OF DROUGHT ON LIVELIHOODS OF ETHIOPIANS, THE EXTENT OF PEOPLE'S VULNERABILITY AND THEIR COPING MECHANISMS. A CASE STUDY OF NORTH SHOA ZONE for fulfillment of the requirements of the thesis for the Masters in Public Management and Policy (MPMP) program of Addis Ababa University. I feel that your contribution and information obtained from you is essential for success of this research thesis. Thus, I appreciate your cooperation to give me your time for the success of this research thesis. I assure you that the information to be shared by you will be used only for academic purpose and kept confidential.

Thank you for your cooperation

Yours sincerely

Defferew Kebebe

Interview with Disaster Prevention and Preparedness Commission (DPPC) officials

1. Name----- position/profession-----, years of work in the office -----
2. What are the impacts of drought on livelihoods in North Shoa Zone?
3. How the impact affects the society as a whole? i.e socially and economically
4. Who is more vulnerable to the impacts? Why?
5. What is your role in alleviating drought related impacts?
6. What are the major challenges in alleviating the problem and what do you think should be done?

Thank you

**Interview with Agricultural and Rural development office officials,
Development Agents, livestock experts and others**

1. Name-----position/profession-----, years of work in the office -----
2. What is the agro-ecology of your zone/Woreda/kebebe?
3. Is there any form of change/variability in precipitation and temperature in your zone/Woreda/kebebe? If yes, please, can you explain?
4. If the answer to question Q3 is yes, please would you mind to explain the extent of drought impacts on crop production and livestock rearing and on other livelihoods of people in your zone/Woreda/kebebe?
5. What are the major socio-economic impacts of drought on the life of local communities in your zone/worerda/kebebe? How?
6. Who is more vulnerable to the impacts? Why?
7. What are the coping mechanisms used by the local society to reduce the impacts?
8. Do you think the enhancement of these adaptations/coping mechanisms have contributions in promoting sustainable development? Yes/No, if yes, how?
9. Is there any effort made by local institutions (government, NGOs, and civil society) in reducing the impacts of drought on society in order to make their life sustainable? Yes/No, if yes, what and how?
10. If the answer to Q9 is yes, what about their plan and readiness in reducing drought related impacts in the future?

11. What are the main challenges in aggravating the impacts and how do you think they can be improved?

Thank you

Interview with local households

1. Name-----sex-----age-----
2. Marital status married-----single-----other (specify) -----
3. What is your educational level? Illiterate-----primary school-----
secondary school----- graduate-----
4. Do you have children? If yes/No, how many-----
5. How do you make your life? Cattle rearing-----crop production-----
, both----- other (specify) -----
6. How much money you earn per year (approximately) -----
7. Do you or and your family member have another sources of livelihood other than agriculture? Yes/No, if yes, specify-----
8. Do you have own land? If yes, how much? -----
9. How many livestock do you own?
10. How do you characterize the weather of this area in terms of precipitation and temperature? Is there any change? If yes, how?
11. Have you ever faced any drought related impacts in your life time? Yes/No,
12. If the answer to Q11 is yes, did it affect your cattle or and crop? If yes/No, how much? -----

13. To what extent that has affected you and your family in terms of food insecurity, malnutrition cases, failure to fulfill financial requirements, increased susceptibility to disease, educational dropout and health?

14. If the answer to Q13 is yes, how did you cope/adapt with the situation?

15. Do you think that these adaptation/coping mechanisms can a decisive factor in bringing sustainability in your life? If yes, how?

16. Who do you think is most harmed by the events? Why?

17. Is there any effort made by institutions (government, NGOs and civil societies) to you and your family to overcome the impacts before, during and after the events?
Yes/No.

18. If answers to question Q17 is yes, what have been done for you? and when?

19. What are the major constraints you have that hinder your adapting/coping mechanisms?

Thank you

D). Guidelines for Focused Group Discussions

1. How do you characterize the weather of this area in terms of rainfall and temperature?

Is there any change? If yes, how?

2. What are the coping strategies that help you to cope up with impact of drought?

-indigenous/local coping mechanism

-coping strategies provided by exterior

Thank you

Appendix –II

Interview questions: Oromic version

A).Gaaffii komishinii Ittisa Balaa fi qophaa'inaatiif

1. Maqaa-----taayitaa/ga'ee hojii-----muuxannoo hojii-----
2. Dhiibban gogiinsi/hanqinni roobaa madda galii ummataa (oomisha midhannii, hori horsiisu fi kkf) irratti qabu maali?
3. Dhiibbaan Kun haala akkamiitin ummata miidha? Rakkoon hawwasummaa fi diingdee inni qaqqabsiisu maal fa'a?
4. Warren kamtu baay'inaan dhiibbaa kanaaf saaxil baha? Maaliif jettanii yaaddu?
5. Ga'een isiin rakkoo gogiinsaan walqabatee dhufu ittisuuf qabdan maal fa'a? kanaan dura waan gootan qabduu? Fuulduraaf hoo qophiin keessan maal fakkata?
6. Dhiibaa googiinsaa kana hanbisuuf ykn xiqqeessuu irratti rakkoolee jiran maali jettu? Rakkoleen kun hoo akkamitti fooyya'uu qabu jettu?

Galatoomaa

B).Gaaffii Hojjetoota Waajjira Qonnaa fi Misooma Baadiyyaa, Hojjetoota Ittisa Balaa fi Qophaa'inaa, Ogeessa Haala Hormaata Loonii fi kkf niif

1. Maqaa-----taayitaa/ga,ee hojii-----muuxannoo bara hojii---
2. Haalli qilleensa goodina/aanaa/ganda keessanii maali? Baddaa,badda dare ,gammoojjii
3. Goodina/aanaa/ganda keesan keessatt haalli jijjiiramni roobaa fi ol ka'iiinsi hoo'aa itti mu'atu jiraa? Jira yoo jettan, naaf ibsuu dandeessuu?
4. Godina/aanaa/ganda keessan keessatti dhiibban gogiinsi madda galii jireenya ummataa(ommish midhaanii, horii horii horsiisuu fii kan birr iraan ga,e ni jiraa? Yoo jiraate haala kamiin ibsitu?
5. Goodina/aanaa/ganda keessan keesatti dhiibaawwan guguddoo gogiinsi jireenya ummata naannoo irra geessisu maal fa'a? haala kamii?
6. Warren kamtu dhiibbaa kanaaf yreoo ba'ee saaxil baha jetteet yaadda? Maaliif?

7. Uummanni naannoo dhhiibbaa goginsaa isaan qunname dandamatani jiraachuuf wanti/malli/tooftaa isaan dandeechisu maal fa'a?

8. Tooftaawwan kannneen cimsuu fi jajjabeessun misooma walitti fufiinsa qabu fiduu keessatti g'ee qaba jettaniit amantuu? Yoo ni qaba jettan haala kamiin?

9. Dhiibbaa gogiinsaana ummata mudate hir'suuf dhaabbilee naannootti argaminiin(mootummaa, mit-mootummaa fii hawwasawaa) tiin gargaarsi /wantoonni tasifaman jiraa? Jira yoo ta'e, gargaarsi taasifame maal fa'aadha? haala kamiin? Qophiin isaan fuulduratti dhiibbaa kana hir'suuf qabaan hoo maal fakkata?

10. Dhhibban kun irra calaatti akka cimaa deemu wantoonni tasisan maal fa'a? rakkoolee kana haala kamiin fooyyessuun danada'ama jettaniit yaadu?

Galatooma

C). Gaaffii uummata Naannotiif Qophaa'e

1. Maqaa-----saala-----umri-----

2. Haala fuudhaa fi heerumaa fuudhe/heerume-----hinfuune/hinheerumne-----
-----kan(ibis)-----

3. Sadarkaa barumsaa(hin baranne, sadarkaa 1ffaa, 2ffaa, eebbifame)

4. Ijoolee in qabdaa? yoo qabaatte, meeqa?

5. Jireenya kee maalin geggessita?(horii horsisun, miidhhan oomishuun, kan biro yoo jiraate ibis)

6. Tilmaaman qarshhin ati waggaatti argattu meeqa ta'a?

7. At ykn miseensi maatii keetii madda galli jireenyaa qonnan alaan alla ni qabuu? Yoo qabatan maal fa'a?

8. Lafa ni qabdaa? Yoo qabatatte, heectara meeqa ni ta'a?

9. Horii meeqa qabda?

10. Haala roobaa fi tempireechara naannoo kana akkamiin ibsita? Kan durii irraa wanti jijjirrame jiraa? Yoo jiraate akkamitti?

11. Umrii kee keesaatti gogiinsaana wal qabatee wanti si qunname ni jiraa? Eeyyen/hin jru

12. Ni jira yoo jette, hori/loonii fi oomisha kee kan midhaanii irra wanti gahe ni jiraa? Hammamtu si jalaa miidhame?

13. Inni kun si ykn miseensa maatii kee gama dhabiinsa wabii nyaataa, nyaat madaalama dhabuu, hi'na maallaqqaa,fayyaa, harca'iinsa mana barumsaaa irraa fi dhibeef saaxil bahuu haala itti miidhe akkamiin ibsita? (Baay'ee,giddu-galeessaan, xiqqoo).

14. Rakkoo kana akkamiin dandamattu? Wanti isin dandamachiisu maal fa'a?

15. Malli isin fayyadmtan kun itti fufinsa jireenya keessaniif wabiidha jettanii yadduu?

16. Irra jireessaan nammota akkamiitu baay'inaan miidhama? Maaliif jettu?

17. Rakkoo googiinsaan wal qabate jalaa si/maatii kee baasuuf dhaabbilee naannoo(mootummaa,miti-mootummaa fi hawasummaa) tiin wanti godhame ni jiraa?

rakkon dura fi booda?

18. Ni jira yoo jette, maal fa'atu siif godhame?

19. Maloota adda addaatti fayyadamtanii Rakkoo gogiinsaa jalaa bahuuf wanti isin rakkise maal fa'aa?(maallaqa dhabuu,beekumasa dhabuu).

Galatooma

D). Gaaffii Marii Gareetiif qophaa'e

1. Haala roobaa fi tempireechara naannoo kana akkamiin ibsita? Kan durii irraa wanti jijjirrame jiraaa? Yoo jiraate akkamitti?

2. Rakkoo gogiinsaan wal-qabatee akkamiin dandamattu? Wanti isin dandamachiisu maal fa'a?

3. Rakkoo googiinsaan wal qabate jalaa si/maatii kee baasuuf dhaabbilee naannoo(mootummaa,miti-mootummaa fi hawasummaa) tiin wanti siniif godhame ni jiraa? rakkoo dura fi booda,

Galatooma

Declaration

I, hereby declare that this Master’s thesis on “the Impacts of Drought on Livelihood, Vulnerability and Coping Mechanisms: The Case of North Shoa Zone” is entirely my own work and that it has never been submitted as an exercise for a degree of any other university and all sources of materials used for this study have been duly acknowledged

Defferew Kebebe

Signature _____

Date _____

Affirmed by advisor:

Mulugeta Abebe (PhD)

Signature_____

Date_____