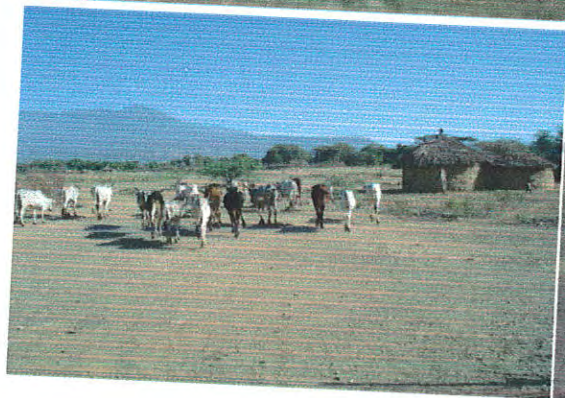
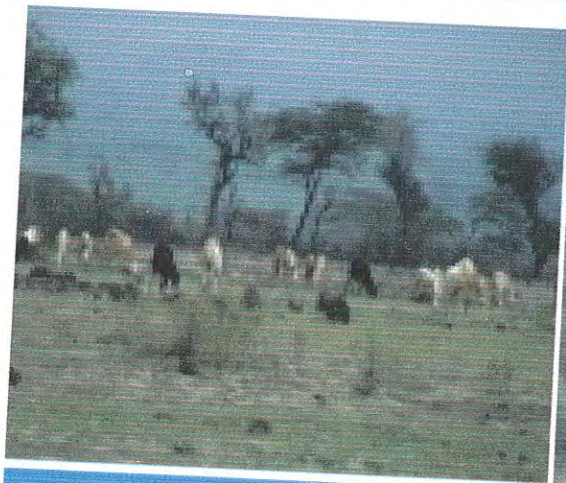
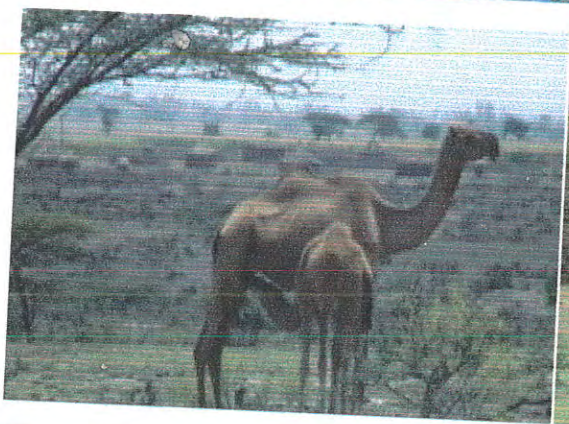






ADDIS ABABA UNIVERSITY
SCHOOL OF GRADUATE STUDIES
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INSTITUTE OF REGIONAL AND LOCAL DEVELOPMENT STUDIES

**PATTERNS OF DROUGHT AND COMMUNITY RESPONSES IN FENTALE
PASTORAL WOREDA, OROMIA REGION**

BY:

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THESIS SUBMITTED TO THE SCHOOL OF GRADUATE STUDIES OF ADDIS ABABA UNIVERSITY
IN PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR THE DEGREE OF MASTER OF ARTS
IN REGIONAL AND LOCAL DEVELOPMENT STUDIES

JUNE 2010
ADDIS ABABA

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Acknowledgements

Thanks to the almighty God in the name of Jesus Christ for helping and giving me the wisdom and courage to study about the patterns of drought and community responses in Fentale Woreda and to learn from them their generations old life experiences and practices.

Great thanks go to my advisor, Dr. Akilu Amsalu, for his genuine guidance, inputs, and critical review of the paper. I extremely appreciate his immense contribution, specifically, in the amendment of the title in to a sound full and workable research topic which make simplify the demeanor of the study with manageable difficulties. The contribution of my previous boss, Habtamu Tekka, now a PhD student since mid 2009 at a Pretoria University is my long memory for his special support by withstanding a shaky environment and taking a personal responsibility in providing me a heart full permission for attending of this my education.

I am also glad to acknowledge the valuable and indispensable contributions from different institutions. First, I would like to thank the Institute of Regional and Local Development Studies (IRLDS) for its financial support to undertake this research. My special thanks also to Horn of Africa Regional Environmental Centers and Networks for their fair, impartial and critical reviewing of the research proposal when undertaking selection for 2009/10 DDAR fund granting. In this case, again I would like to thank my advisor Dr. Aklilu Amsalu, had it not been him I had no information at the time to compete for the granting. I also acknowledge Pastoralist Forum Ethiopia for its financial and material support to undertake this research.

The success of the research was also due to the Karrayu Oromo communities of Fentale Woreda who provided me all the necessary information required in the process of realization of the study, specifically, my thanks go to Hadji Qasaro Jilo, Bati Rooba, and Gudeta Boru my key informants and local Karrayu scholars for their unreserved provision of detail information; and to those people in the two villages who gave me time and opportunities to learn from their experiences and exchange ideas and views about the patterns of drought and their responses.

My special Gratitude also to Mr. Feyisa Tefa and Tegegn Guddeta from OPDAC, Dr. Tarekegn Tola from FAO – Ethiopia, Abubakar Jamal from FAO-Ethiopia, Nega Tesfaye from LVIA, Fekadu Abate from OPC, Melkamu Delju from UNDP, and for all various Fentale Woreda offices for their valuable input and provision of all the necessary information.

Last but not least, my sisters' suphe Bekele and Dhunfe Bekele receive the remaining acknowledgements for their continuous moral support during the whole school and research time. Finally, all friends and colleagues who supported me and contributed to the paper are highly acknowledged.

Table of Contents

Content	Page
<i>Acknowledgments</i>	<i>i</i>
Table of contents.....	ii
List of Tables.....	v
List of Figures.....	vi
Acronyms.....	vii
Abstract.....	viii
CHAPTER ONE	
<i>Introduction</i>	1
1.1 Background of the Study	1
1.2 Statement of the Problem.....	2
1.3 Objectives of the Study	5
1.4 Research Questions.....	5
1.5 Research Methodology	5
1.5.1 Sampling Techniques.....	6
1.5.2 Methods of Data Collection	7
1.5.3 Methods of Data Analysis	11
1.6 Significance of the Study	11
1.7 Scope and limitations of the study.....	11
1.8 Organization of the Thesis.....	12
CHAPTER TWO	13
<i>Review of Related Literature</i>	13
2.1 Theoretical Review	13
2.1.1 Conceptualizing Pastoralism	13
2.1.2 Conceptualizing Drought.....	15

2.1.3 Conceptualizing Livelihood.....	16
2.1.4 Pastoral Livelihoods.....	17
2.1.5 Pastoralists' Response Mechanisms to drought: Dynamics of pastoral mode of life.....	20
2.1.6 Natural Disaster.....	23
2.2 Empirical Review	25
2.2.1 Pastoralists in Ethiopia	25
2.2.2 Challenges to Ethiopian Pastoralists	26
2.2.3 Responses to Climate Change	33
2.2.4 Conceptual Framework.....	36
CHAPTER THREE	39
3.1 Pastoral Areas of Oromia.....	39
3.1 Location	39
3.2 Administration.....	41
3.3 Physical Features of the Study Area.....	41
3.4 Population	42
3.5 Economic Activity	42
3.6 Social and Economic Service	43
CHAPTER FOUR.....	45
Results and Discussions	45
4.1. Background of the Respondent Households.....	45
4.1.1. Sex and Age Distribution of the Respondents	45
4.1.2 Educational Status of the Respondents	46
4.1.3 Occupation of the Respondents.....	46
4.1.4 Household Income	47
4.2 Patterns of Drought in the Study Area.....	48
4.2.1 Past and Present Patterns of Drought in the Study Area.....	48

4.2.2 Severity of Drought in the Study Area: Magnitude of Hotness and Wind Speed.....	51
4.2.3 Rainfall Characteristics of the Study Area.....	54
4.3 Effects of Droughts on Livelihoods of Fentale Pastoralists-----	57
4.3.1 Effects of Droughts on Availability of Pasture	57
4.3.2 Effects of Droughts on Availability of Water.....	60
4.3.3 Effects of Droughts on Herd Size: Herd Dynamics of the Study Area.....	61
4.3.4 Effects of Droughts on Livestock Production and Productivity	66
4.3.5 Effects of Droughts on Pastoralists' Terms of Trade.....	69
4.3.6 Effects of Droughts on Pastoralists' Households Food Security	72
CHAPTER FIVE.....	75
5 Responses to Drought	75
5.1 Internal Responses	75
5.1.1 Pastoral Activity Responses	76
5.1.2 Non Pastoral Activity Responses.....	85
5.1.3 Factors Challenging Internal responses (Response of pastoralists) to drought	93
5.2 External Responses.....	111
5.2.1 Government Responses	111
5.2.2 NGO Responses	116
CHAPTER SIX	118
6. Conclusion and Recommendation	118
6.1 Conclusion	118
6.2 Recommendations.....	120

List of Tables

Table	Page
Table 1. Livestock population of the District	43
Table 2. Demographic Characteristics of the respondents.....	45
Table 3. Distribution of households according to their Educational Status.....	46
Table 4. Occupation and Average Farm size of the Households.....	47
Table 5. Household annual income.....	47
Table 6. Percentage of Households responses on the patterns of drought	49
Table 7. Household responses on the severity of drought or hotness of the sun and wind speed (%)	52
Table 8. Huseholds' responses on the intensity and length of rainfall month in the study Area (%)	55
Table 9. Some grass and tree species that is lost from the range lands by drought	60
Table 10. Death of livestock by drought in Yaya and Dirre Redie village (2001/2 and 2007/8)	62
Table 11. Percentage of household responses on the adverse effects of drought on the household herd size	65
Table 12. Paired T – test made to compare the level of average household livestock holding before 10 years and in the present day	66
Table 13. Percentage of Severity and Effects of Drought on Livestock Production and Productivity	68
Table 14. Percentage of household responses on adverse effects of drought on pastoralists' Terms of Trade	72
Table 15: Number of Beneficiaries in Safety Net Programme (PSNP) by Year	74
Table 16. Numbers of emergency Aid beneficiaries in the woreda	74
Table 17. Percentage of an extent of mobility in response to drought to distant places....	77
Table 18. Percentage of households Extent of Herd Diversification in Response to Drought	79
Table 19. Percentage of household responses on natural resource management practices	84
Table 20. A Simple Model of an extent of households' response Mechanisms to drought that is aggravated by climate change in Yaya and Dire Redie villages of Karrayu Oromo Pastoralists in the past and present day.....	92

List of Figures

Figure	Page
Figure 1: Graphic explanation of livelihood definition	17
Figure 2: The Sustainable Livelihood framework	18
Figure 3 (a). How natural and manmade factors intensify the disaster effects of natural catastrophes.	24
Figure 3 (b). Models of Ecosystem Dynamics.....	24
Figure 4 Conceptual Framework of the study-----	38
Figure 5. Location of the study area	40
Figure 6 Annual maximum temperatures in the study area (1984 – 2009)-----	53
Figure 7. Annual Minimum temperatures in the study area (1984 – 2009)-----	54
Figure 8: Annual rainfall of the study area (1984 – 2009)-----	56
Figure 9: Scarcity of pasture in the rangelands.....	58
Figure 10. Past and present herd size of Yaya and Dire Redie Villages households'	64
Figure 11. Past and present day amount of milk per livestock per day in Yaya and Dire Redie Village.....	69
Figure 12 . Pastoral households herd diversification	78
Figure 13. Charcoal selling by the pastoralist households.....	89
Figure 14: Invasion of rangelands by unpalatable tree species.....	96
Figure 15: Rangeland degradation	98
Figure 16. The relation of wealth (in terms of livestock) and Annual non pastoral activity income	101
Figure 17. Relation of HHH wealth to an extent of HHH responses to a set of non pastoral activity	103
Figure 18. Relation of HHH age and income from non pastoral activity (NPA)	104
Figure 19. Relationship of HHH educational level to an extent of HHH responses to a set of non pastoral activities.....	105
Figure 20: Fentale Irrigation project.....	112

Acronyms

A.D.	After Death
ASAL	Arid and Semi-arid Low Lands
B.C	Before Christ
CBPP	Contagious Bovine, Pleura Pneumonia
CCPP	Contagious Caprine Pleuropneumonia
CSA	Central Statistical Authority
FAO	Food and agriculture organization of the United Nations
FGD	Focus Group Discussion
Gos	Government Organization
HPG	Humanitarian Policy Group
IIED	International Institute for Environment and Development
KM	Kilo meters
NGO	Non Governmental Organization
KII	Key Informant Interviews
MoARD	Ministry of Agriculture and Rural Development Office
MM	Millimeter
OPaDC	Oromia Pastoral Area Development Commission
PA	Pastoral Association
PFE	Pastoralist Forum Ethiopia
SNNPR	Southern Nations Nationalities and Peoples Region
TLU	Tropical Livestock Unit
UNDP	United Nations Development Programme
WRaADO	Woreda Rural and Agricultural Development Office
WCO	Woreda Cooperative Office
WFSO	Woreda Food security office
ZDPPO	Zonal Disaster Prevention and preparedness Office

Abstract

Pastoralism is a rational, adaptable, tried and tested production system uniquely suited to the dry lands. Pastoralism occupies a quarter of the world area, which is predominantly arid and semiarid. Pastoralism developed autonomously across the world's dry lands from some 7000 years ago. It is still widely practiced today and remains a dominant feature of rural east African in which most household sustain their means of living from keeping domestic livestock. The arid and semi-arid areas of Ethiopia, which covers 61 % of the land area of the country, are homes for millions of pastoralists of diverse ethnic groups. The Karrayu Oromo of Eastern shewa Zone are among the ethnic groups those practicing pastoralism under marginal condition and high production risk because of the natural and different manmade factors; in which drought is the major serious natural hazard and is continuously threatening the lives and livelihood of pastoralists.

This study was conducted in Fentale Woreda of Eastern Shewa Zone with the objectives of investigating the patterns of drought and community responses in the Fentale Pastoral Woreda of Oromia Region. To conduct this study, a total of 134 purposely sampled households, focus group discussion participants, some individual case studies, knowledgeable key informant interviews and secondary data sources were used.

The finding of the study indicates that in the present day, especially, post 2002; the pattern of the drought in the Fentale Woreda is distorted from its past normal cycle. In the present day, drought cycle is shortened, drought is occurred every year or every other year and the severity of drought is extremely increased. The increase in frequency and severity of drought has posed multi- dimensional adverse effects on the Karrayu pastoralists' livelihood sources. It caused extinction of pasture from the rangelands, dried up water points; unusually caused break out of new and existed human, livestock and plant pests and diseases, declined household livestock holding size; reduced production, productivity and reproduction of livestock; and has resulted in chronic food insecurity. As a result, in the present day, pastoral mode of life of Karrayu pastoralists' are in a continuum fluxes.

In the present day, Karrayu pastoralists have been practicing a set of pastoral and non pastoral activities as response mechanisms to mitigate the adverse effects of severe drought that is aggravated by the recent climate change. An extent of household responses towards both pastoral and non pastoral activities are varied, in which the household characteristics, specifically, wealth in terms of livestock holding is the decisive factors for the engagement of the household in any one or more of a set of productive activities/response mechanisms/. It is found that there are various natural and manmade factors that are challenging response mechanisms that are undertaken by Karrayu pastoralists' to mitigate the adverse effects of severe drought that is aggravated by climate change. Hence, designing of holistic (multidisciplinary which comprise pastoral and non pastoral activity and people centered) development approach is a decisive factor in order to build an appropriate response capacity at a local level to mitigate the adverse effects of drought and to develop adaptation to drought/ climate change/in a sustainable and sound full manner instead of taking only sedenteray agriculture as a sole final option in responses that is undertaken to drought.

CHAPTER ONE

Introduction

1.1 Background of the Study

Pastoralism is a rational, adaptable, tried and tested production system uniquely suited to the dry lands. Pastoralism occupies a quarter of the world area, which is predominantly arid and semiarid. Pastoralism developed autonomously across the world's dry lands from some 7000 years ago (Brooks, 2006). It is still widely practiced today and remains a dominant feature of rural east African in which most household sustain their means of living from keeping domestic livestock (Anderson et al., 2008). Pastoralism is practiced under marginal condition and high production risk because of different natural and man made factors in which drought is the major serious hazard and continuously threatening the livelihood of pastoralists 'in an alarming rate.

Pastoral areas of Ethiopia comprise approximately 63% of the total land area. Pastoralists own 73% of the goats, 25% of the sheep, and 20% of the cattle and a substantial proportion of the camels. They have low population densities. Pastoralism is an important mode of life for about 12 % of Ethiopia's populations (Coppock, 1994; Hogg, 1997b; Sand ford and Yohannis, 2000). Pastoralists possess relatively high financial assets in the form of livestock. Extensive, mobile pastoralist livestock production systems are a rational and efficient use of natural resources in non-equilibrium environments. And thus pastoral areas are contributing to domestic and export markets. However, pastoral areas are characterized by low levels of infrastructure development and weak social service. Pastoralist areas face recurrent drought with indications that the frequency and severity of drought is increasing at an alarming rate since 1950s (MoARD, 2008).

In Ethiopia there have been six drought episodes between 1965 and 1995: 1965-66, 1972-74, 1981-84, 1986-87, 1991-92 and 1994-95. Drought affects the livelihood of pastoralists and in turn their responses to cope the conditions (ESAP, 2000). At socio-economic level, drought is a function of variables that highly affect the mix of grazing and water resources. The frequency and severity of drought has also been increasing from time to time over the last few decades. The most widely known disasters and famine includes of the 1973/74, 1984/85 and 1994 had almost a ten year regular pattern. But now a days many rural communities are experiencing drought almost every year. Food aid beneficiaries' data from the DPPC early warning department revealed that in five consecutive years between 1998 and 2002, 6.3 million people on an average in the country

were exposed to hunger on yearly basis (CRDA, 2002). The prime effects of meteorological drought are shortages of water and feed. This shortages in extended time forces the pastoralists to loss their assets mainly their livestock (Solomon Desta, 1999).

In Fentale woreda of Oromia region, pastoral production system manifests low level of production and productivity. The reasons why it is held below its potential level include the inherently hazardous and risky natural environment (increase in frequency and severity of drought due to climate change); and man made factors such as institutional, market, policy environment and in general socio-economic factors. These resulted in weakening of the effective traditional drought response mechanisms which help pastoralists to survive in this harsh to live environment from generation to generation.

1.2 Statement of the Problem

The frequency and severity of drought has been increasing from time to time over the last few decades. This is resulted in the economic, environmental, social and cultural losses in the pastoral area of east Africa. Hence, peoples' adaptations change as conditions alter and a snapshot of pastoral mode life today is but one in a sequence of moving images. Such losses will continue to sap the ability of the pastoral sector to deal with drought, until decisions are taken to address positively the particular needs of these producers (Bayer and Waters-Bayers, 1996).

The history of Ethiopia has been closely related to the drought and famine. According to Patriek et.al (1992) crisis linked to famine and drought have been traced back as far as 250 B.C. A total of at least 35 periods of food shortage with high human and livestock mortality have been recorded. These events have been concentrated partly in the crescent of low lying pastoral and agro – pastoral areas of the country. These include from Wollo in the north, through Hararghe and Bale (Oromia region), Sidamo and Gamu Gofa (SNNPR), Afar and Somali region. Using Oral Borana History (Gufa oba, 1998), drought in the area started about 1600 A.D. Drought can be expressed in terms of failure of rain and forage growth, shortage of feed, declining in livestock production and productivity to the extent of causing mortality. In Ethiopia food shortage, drought, and famine have been cyclic since the last 30 - 40 years. Currently the situation has been more pronounced and frequency has become shorter securing between 2-3 years. The recurrent drought has brought about significant effect on the declining of the range land resources, the productivity and survival of livestock.

The kereyu , who have been the indigenous inhabitants of the Metehara plain and Mount Fentale area are Oromo pastoralists. For the Kereyu Oromo of Fentale wereda the situation appears serious; and in the present day, the area even not receive rain for a year and is facing water shortage, when generally erratic rains are experienced. The expansion of the large-scale irrigated agriculture and an extensive network of conservation areas for parks have largely aggravated the adverse impacts of drought on lives and livelihood of Kereyu pastoralists. In addition to development intervention expansion of Lake Beseka has taken the best of Kereyu Oromo pastoralists' grazing land (UNDP, 2002).

Drought is one of the major hazardous frequently challenging/facing/ pastoralists of the Fentale Woreda of Eastern Shoa zone. It damages the livelihood of people and destroys continuously the economy of the area. The frequency and seriousness of the drought appears to be increasing. Drought is a natural, recurring part of climate of the Fentale pastoral woreda. But until fairly recently, it caused relatively few problems: people knew traditionally how to deal with them. Pastoralists moved away from droughts stricken lands in to areas with more reliable sources of water and better grazing. When rains returned, they moved back to their rangelands and also use other traditional coping strategies like herd splitting, herd diversification, social support, meal reduction and use of wild foods.

But people can no longer use these traditional coping mechanisms to respond to drought. Pastoralists are no longer free to move their animals where they will. Policies restrict traditional pastoral mobility. The karrayu traditional dry season grazing land has been converted to other uses such as commercial farming and conservation parks. The routes to water sources are closed to the herders by the commercial farming (Metehara sugar cane plantation) and Awash national parks; Pastoralists are forced to stay in more marginal areas. Conflict on resources with neighbor ethnic groups restricts movements further; people are afraid to use good rangelands. Poorly developed market mean that pastoralists can not sell livestock when they need to. Government policies encourage pastoralists to settle in one place – removing the flexibility to move in response to changing water and vegetation patterns. Well meaning development and relief efforts save lives in the short term – but fail to save the livelihoods on which people depend. Due to this drought triggers emergency. The animals that people rely on go hungry and thirsty. They die of

hunger, disease and exhaustion. The humans are not far behind due to the deterioration of their livelihood base.

Wealth of the local knowledge is not taken into consideration, no/little effort is undertaken to alleviate factors that are challenging the responses that are undertaken by pastoralists to drought. Rather blue print planning development intervention i.e., sedentary agriculture is taken as the final option to mitigate the adverse effects of recent severe drought. Even though it is a segments of an opportunity in responses taken to drought, changing the pastoral mode life to sedentary life will require a long evolutionary process, and also risky and difficulty task under un equilibrium environment with poor technology and capital.

According to Anderson et al. (2008) from many land uses in the dry lands pastoralism is the most resilient against climatic variability and change than others. Hence, identifying the root cause of the problem/ effect/ that put the livelihood of the Fentale Pastoral Community under question is a more fundamental one, prior to making emphasis to only a single blue print option (sedentary agriculture). Increase in severity and frequency of drought in the pastoral woreda of Fentale in the last two decades are part of the global climatic change. So, identifying the patterns (frequency and severity) of drought is more fundamental one for both local people and external agencies to undertake appropriate response mechanisms to drought. In the present day, adverse effects of drought is more aggravated due to the lack of understanding and information about the patterns of drought and lack of well identified appropriate and relevant response mechanisms. Furthermore, no research is done on the patterns of drought and community responses for pastoral areas of the country including Fentale Wereda pastoralists.

The researcher participated in the campaign of livestock feed delivering from North Shewa to Borena and Karrayu during the severe drought of 2007/08. The 2007/8 drought was resulted in death of 100,000 livestock of Borena pastoralists' (FAO, 2008). The Fentale pastoralists claimed that occurrence of recent drought is spontaneously and beyond their understanding unlike in the past due to the variation of the present day drought cycle from its regular pattern (both in severity and frequency). Hence, community can not get the likelihood of using available opportunity to mitigate the adverse effects of drought on their livelihoods. This and other adverse effects of drought initiate the researcher to identify the patterns of drought and community responses in regard of the changing pattern of drought in Fentale Pastoral Woreda of Oromia.

1.3 Objectives of the Study

The general objective of this research is to investigate the patterns of drought, pastoralists' responses to drought and dimension of the pastoral mode of life in Fentale pastoral Woreda of Oromia regional State.

The specific objectives of the research are:

- To investigate the patterns of drought and its adverse effects on the dominant pastoralists' livelihood,
- To identify responses that are undertaken by pastoral communities to drought in the study area,
- To know factors that are challenging response of pastoralists' community to drought and to identify available opportunities,
- To know the dimension of the pastoral mode of life of the study area

1.4 Research Questions

The research question includes:

1. What are the patterns of drought in the study area?
2. What are the responses that are undertaken by pastoral communities to drought?
3. What are the adverse effects of drought on the pastoralists' livelihood?
4. What are the factors challenging response of pastoralists to drought? And what are the available opportunities?
5. What is the dimension of the pastoral mode of life of Fentale Wereda pastoralists?

1.5 Research Methodology

In this research both qualitative and quantitative methods of data collection is used in order to get reliable data that were help to attain the intended objectives of the study. The qualitative approach of this study comprised key informant interview, focus group discussions, case study and direct observation, where as the quantitative approach is employed through a cross sectional household survey.

1.5.1 Sampling Techniques

Despite the accepted superiority of probability sampling techniques, non probability sampling technique is used in this research. Non probability sampling techniques is used based on purposive sampling for selecting all the research subjects in this study due to lack of sampling frame, style of pastoral mode of life (mobility) and climatic condition of the area. The selection process is presented hereunder

Selection of the Region

Oromia national regional state, specifically Oromia pastoral area, is purposively selected for this study. The fundamental reason for the selection of the region is familiarity of the researcher to the area.

Selection of the woreda

The selection of the Fentalie pastoral woreda was purposely for many reasons. Among others, accessibility of the woreda than other pastoral woredas in Borena, Gudji and Bale zone of Oromia regional state. Furthermore, Fantale pastoral woreda is exposed to various natural and man made factors that are incessantly challenging the pastoralists' livelihood and pastoral mode of life i.e. the increase in frequency and severity of drought, the invasion of the pastoralist traditional dry season grazing land by unpalatable exotic species and the indigenous species, decline of herd size due to recurrent drought, the curtailment of mobility due to commercial farming, parks and conflict with Afar and the Issa Somali. These and other factors which have grave debilitating impact on the pastoral livelihood and traditional pastoral way of life is among the major issues that instigate the researcher to opt for the Fentale woreda as a research subject.

Selection of the Kebeles and Villages

Out of 20 kebeles, the most two (2) representative kebeles such as Dhega Heddu and Gelecha were purposively selected by the researcher for the exploration of variables under the study. Dhaga Heddu is among the most pure pastoral kebele and Gelcha is among the Agro – pastoral kebeles of the woreda. The two kebeles represent the other pastoral and agro-pastoral kebeles of the woreda with varying degrees in continuous distressing by the adverse effects of the natural and man made factors such as loss/death of livestock by drought, rangeland degradation, scarcity of pasture, lack of water, invasion of rangelands by unpalatable tree species, conversion of traditional dry season grazing lands for the other uses and poor social and economic

infrastructure. Similarly, again from each kebele one most representative village such as Yaya village from the the Dhega Heddu kebele and Dire Redie village from the Gelcha kebele were purposely selected as a research subject for the purposes of this study.

Yaya village (Dhaga Heddu kebele) is predominantly a pastoral village. The total number of the households residing in the village is estimated at 70. Households in the village are members of the interconnected two clanship family of Baso, Dullacha and Ittu and they are living surrounding the foot of the mount Fentale to triumph over the effects of heavy scorching sun of the dry period through using the shades of the sparse indigenous tree and the scant pasture on the slant of the mountain. Dire Redie is an agro-pastoral village. The total number of the household residing in the village is estimated at 120. Similarly households in the village are the members of the interconnected two clanship family of Baso and Dullecha. The village is residing between the Awash national park and the Metehara sugar cane plantation and they are among the most seriously humiliating village due to the conversion of the traditional rangelands for other land uses by the outsiders and unremitting drought hazardous which forced them to engage in the opportunist farming in this non-equilibrium environment as a means of responses to adverse factors (both natural and manmade factors) for the aim of diversifying their livelihood base. The study is conducted on 75 % of the households in Yaya and Dire Redie villages (see the detail in the section 1.5.2).

1.5.2 Methods of Data Collection

In this study, the researcher has collected both quantitative and qualitative data through various methods. Qualitative and Quantitative data with their respective primary and secondary data have been collected from different sources to make the data and findings of the research more reliable.

Data Sources

In this study, both primary and secondary data as well as the respective quantitative and qualitative data sources were used. Majority of the data source was the primary data gathered by the researcher through household survey, key informants, focus group discussions, direct observations and case studies. Whereas the secondary data were collected from published and

unpublished documents such as concerned bodies office records (GOs and NGOs), journals, proceedings, books, published and unpublished research papers and internets.

Primary Data Collection

In this study, primary data were collected through household survey, focus group discussions, key informants, direct observation and through case studies. The major types of primary data that were collected are patterns of drought, adverse effects of drought on the pastoralists' livelihood, responses that are undertaken by the pastoralists to drought, factors that are challenging responses that are undertaken by pastoralists to drought and available opportunities as well as the dimension of the pastoral mode of life of the Fantale woreda pastoralists' have been investigated. Past and present adverse effects of drought on the pastoralists' livelihood sources such as adverse effects on pasture, water, households' livestock holdings size, livestock production and productivity and reproduction as well as adverse effects of drought on the pastoralists' terms of trade and food security have been collected, cross checked, triangulated and analyzed with the other data collected through other techniques. In general data of the past and present adverse effects of drought have been collected to identify the severity of drought on the pastoralists' livelihood. Frequencies of drought, severity of drought, drought years, length of drought month and temperatures and rainfall data of the last 20 years were collected to identify recent patterns of drought in the study area. Responses that are undertaken by Karrayu pastoral communities to minimize the adverse effects of conventional and recent severe drought such as a set of pastoral and non pastoral activity responses as well as external responses (GOs and NGOs) have been investigated and collected to identify the dimension of the pastoral mode of life of the pastoralists in the study area. Natural and man made factors that are challenging response of Karrayu pastoralists' to drought as well as available opportunities in drought risk reduction strategies have been collected, cross checked, triangulated and analyzed with the other data collected through other methods.

Household Survey

Out of 20, two most representative kebeles were purposely selected depending on the variables used in the study area which comprised the pure pastoralists (Dhega Heddu kebele) and the agro-pastoralists (Gelcha kebele) in order to achieve the objective of the study. There are 351 households in Dhega Heddu and 765 households in Gelcha kebele. In this study the researcher has

been purposely selected Yaya village from the Dhaga Hedu and Dire Redie from the Gelcha kebele to carry out household survey. The number of household in Yaya and Dire Redie village are 70 and 120, respectively. This study was planned to be demeanor on 75% of the total household from each village. However, due to the household head personal tardy, 9 (6 %) households head (7 households from Yaya and 2 households from Dire Redie villages) were not available during the data collection period. Accordingly, data were collected from 132 (94 %) respondent households, 46 from Yaya and 88 from Dire Redie villages. For the primary data that were collected through household survey, structured questionnaires were designed and pretested before administering to the targeted pastoral households. The researcher has contracted four experienced enumerators who have worked in the woreda at a grass root level (diploma holder development agent) for more than six years. One day training was also given to the enumerators; the training focused on the detailed explanation and full understanding of the structured questionnaire for the household interview and the steps to be followed to approach the community and to collect the required data under the close supervision of the researcher.

Key informant Interview (KII)

Key informants are the research subjects in qualitative studies that have a disproportionate weight and role in the out come of the research (Payne, et. al., 2004). The data that were gathered through key informant interview have been triangulated with other data from household survey and other method of data collection. A total of 15 individuals who have deep and better knowledge about the patterns of pastoral drought, adverse effects of drought on the pastoralists' livelihood, response of pastoralists to drought and factors that are challenging response of pastoralists (coping mechanism) to drought were selected and interviewed to obtain the relevant data. These 15 individuals were people from different social and economic back grounds namely, three community leaders, three elders, three development agents and the three of them are experts in Fentale wereda pastoral development office as well as two from the members of Fentale wereda administration and one from NGO undertaking currently development activities in the woreda (GTF). Semi-structured questionnaires were used for key informants to triangulate information collected through household survey and to enrich the research findings.

Direct Observation

This study has been carried out through systematic observation of livelihood activities that is modified and developed by Fantale pastoralists' as a response mechanisms to mitigate the adverse effects of recent severe drought which comprised both pastoral and non pastoral activities as well as responses that are undertaken by external bodies mainly governments have been observed and triangulated with the data collected through other techniques. In addition to this rangeland condition, water points, availability and accessibility of social and economic infrastructure have been observed and triangulated with the data collected through other methods.

Focus group Discussion

Focus group discussion is one of the most important research tools to collect qualitative data. According to Geoff Payen and Tudy Payen (2004:103) , focus group discussion is a means of collecting data in one go from several people (who usually share common experience) and which concentrates on their shared meanings. Focus group discussion used to “engage participants in a focused discussion of an issue and to produce qualitative data that provide insight into the attitudes and opinion of participants” (Wenda, 2000: 175).

A total of four focus group discussions have been formed in the two target villages in which both men and women have constituted a group each from a village. For both groups the members have been selected purposively based on their personal experience and better understanding about the condition of respective community and variables under the study. The total numbers of participants in the women groups were 4 from Dhega Heddu, and 6 from Gelcha kebeles. The total numbers of men individuals in a group were 4 from Dhegadu and 6 from Gelecha Kebeles. FGD comprised 20 participants from both villages (8 women and 12 men). Checklist was prepared to guide and to make easy the discussion procedure. These focus group discussions were undertaken to get an insight into the patterns of drought and responses that are undertaken by Fantale pastoral community.

Case Study

A total of 6 household case studies have been conducted in the two kebeles. The chief criteria that were used to select case study household was wealth differentiations. The selection included participant from each wealth group (poor, middle and rich). In order to capture women views, out of the six case study households, two of them were women head households, each from a kebele.

1.5.3 Methods of Data Analysis

Quantitative data were compiled using some data analyzing facilities such as frequency distributions, comparisons of mean, cross tabulations from statistical package for social science (SPSS). As a prelude to this, each variable in the questionnaires were coded and entered in to SPSS data entering tools for further data analysis. Following the data entry task, various statistical analyses such as computation of percentages, means, paired T-test values were carried. In addition, tables scatter plot graphs and linear regression graphs have been utilized to display out puts derived from the data analysis. Qualitative descriptive data on the other hand, is compiled and summarized using qualitative data analysis techniques such as tables and case study results in displaying box templates.

1.6 Significance of the Study

It is expected that an understanding of the patterns of the recent severe drought that is aggravated by climate change and responses that are undertaken at grass root level by pastoral communities to the drought risk reduction as well as identifying the factors that are challenging responses of pastoralists to drought are the decisive factors to formulate appropriate measure and plausible strategies for any programme that has aimed to reduce vulnerability in the pastoral areas. Thus, the result of this study can make modest contributions to reduce the adverse effects of drought on the pastoralists' livelihood base through designing of sustainable and appropriate response mechanisms that can mitigate the pastoralists' deprivation due to loss of asset by drought. Hence, it is hoped that the findings /out come of the research will assist planners, decision makers, and researchers for appropriate policy formulation that will result in sustainable drought risk reduction and self reliance of pastoralists in difficulty environments.

1.7 Scope and limitations of the study

In the past, pastoral and agro-pastoral systems of mode of production are important to the global society as they support herders' subsistence with required quantities of food and non food products which play a major role in ensuring local food security, and contribute to the national economies of developing countries. However, in the present day, distortion in the patterns of drought (increase in frequency and severity of drought) that is aggravated by climate change has been continuously challenging the self reliance and potential of the pastoralists in the drought prone areas and has posed chronic food insecurity. Even though, this study has been conducted to

identify the patterns of the drought and community responses in regards of the changing patterns of the drought, it covers only two kebeles from the 18 kebles and the data were collected based on the pastoral households residing in the two villages. Furthermore, due to the failure of Arfasa rains (rainfall season between March to May) few pastoralists from the study village were migrated to other woredas in search of pasture. Hence, the study did not include these households.

Since, the study was limited to the Fentale woreda of Oromia pastoralists', the results and findings are the reflection of the study areas that is difficult to replicate directly to the other areas. The scope of the study was also constrained by time and harshness of the climatic condition of the area. Even though the study was restricted in terms of its coverage, the finding can be used as spring board for more detailed and area specific purposes.

1.8 Organization of the Thesis

This thesis is divided in to five major chapters. The first chapter describes the introductory part, objectives of the thesis, research questions and the significance of the study. Specific research methods used and data analysis system is also discussed in this chapter. It is followed by the chapter two which presents basic literature review of drought and community responses. Theoretical frame works and concepts of the pastoralism and pastoral livelihoods were discussed.

Descriptions of the study area are presented in the chapter three. This Chapter explains about the location, climate, population, biophysical and situation of social and economic service provision of the Fentale pastoral woreda of Oromia region.

Chapter four deal with the presentation and analysis of the findings. This Chapter is the main body of the study and presents past and present patterns of the drought cycle in the study area, adverse effects of drought on the pastoralists' livelihood, responses that are undertaken by pastoralists and external actors to drought. It also presents natural and man made factors that are challenging responses of pastoralists to drought. Moreover, some indicators that reveal fluctuations/ flux of the pastoral mode of life that is caused through responses undertaken by pastoralists to drought are also described in this chapter.

In the last Chapter the author tries to conclude the findings of the study and finally forwards points of policy implications for future research and pastoral development endeavors.

CHAPTER TWO

Review of Related Literature

2.1 Theoretical Review

Relevant conceptual definition of pastoralism, drought, livelihood, and responses to drought are reviewed as follows.

2.1.1 Conceptualizing Pastoralism

Pastoralism is a set of specialized economic activities and techniques revolving around the herding and care of livestock which may be used alone or in combination with other economic activities and techniques at different times and or places. It is also described as a finely-honed symbiotic relationship between people, domesticated livestock and local rangelands in fragile and highly-variable ecosystems, often existing at the threshold of human survival (Bonfigliodi, 1992).

Pastoralism is a successful adaptation to a difficult, unpredictable and inclement environment under certain specific conditions, and that these characteristics are actually necessary conditions for continued pastoral production in the dry lands. It is proposed that sustainable pastoralism in the African dry lands is only possible under conditions of moderate to low population density (Helland, 2000.)

Pastoralists have adapted to the reality of the dry lands that they occupy' and are able to make meaningful use of what are considered to be hardship areas to support their livelihoods. They have developed extensive traditional knowledge about their environment and have evolved survival techniques that are premised on flexibility in natural resource use, mobility and diversification of herds to insure against such eventualities as droughts and disease outbreaks (Roy Behnke et al., 2007).

Mobility can be considered as a rational response mechanism dictated by a state of environmental uncertainty and of spatially uneven distribution of water and pasture resources. The practice of mobility enables pastoralists to move their stocks in order to escape the ecologically localized scarcity in time and space that plagues the pastoral region of the world. The livestock must be moved to the seasonally varied grazing lands for the survival of both the herds and the people,

and this means constant periodic movement in search of water and forage, and these movements are dictated by the availability of resources.

There are essentially two forms of pastoralism namely; nomadic and transhumance. Thus, referring to the case of the Kazaks of Eurasia, Fererro (2001: P.142 as cited in Tarekegn, 2007) defined "nomadic" pastoralism as follows:

A general characteristic of nomadic pastoralists is that they take advantage of seasonal variations in pasturage so as to maximize the food supply of their herds. The Kazaks of Eurasia, for example, keep their livestock at lower elevations during the winter, move to the foothills in the spring, and migrate to the high mountain pastures during the summer. Such seasonal movement provides optimal pasturage and avoids climatic extremes that could negatively affect the livestock. This willingness to move their animals at different times of the year avoids overgrazing and enables them to raise considerably more livestock than they could if they chose not to migrate.

Pastoral nomads follow a seasonal migratory pattern that can vary from year to Year. The timing and destinations of migrations are determined primarily by the needs of the herd animals for water and Pasture. These nomadic societies do not create permanent settlements, but rather they live in tents or other relatively easily constructed dwellings the year round. Pastoralist nomads are usually self-sufficient in terms of food and most other necessities. On the other hand, transhumance pastoralists follow a cyclical pattern of migrations. Transhumance pastoralists usually depend somewhat less on their animals for food than do nomadic ones. They often do small-scale vegetable farming at their summer encampments. They also are more likely to trade their animals in town markets for grain and other things that they do not produce themselves. It should, however, be understood that not all pastoralist societies can be accurately described as following a nomadic or transhumance way of life. As conditions change, pastoralists usually adjust. This can result in a traditionally nomadic society or some families within in it becoming more or less transhumance in their migratory patterns if the opportunity arises. Likewise a society that prefers a transhumance way of life may be forced by circumstances to change to a nomadic pattern for some or all of its livestock.

Even though collapsed in the present day due to the appropriation of their dry season grazing land by out siders, seasonal mobility dictates a particular type of settlements in Karrayu pastoral areas. Most often, it is possible to identify three types of settlements in Karrayu pastoral areas which are based on the temporal and spatial variations in rainfall season. "Ona Ganna" is the long rainy

season settlement from June to September. Ona Ganna is mostly undertaken in upper valley areas to safe guard human lives from the adverse effects of malaria and other water borne diseases during the heavy rainy season. Ona Birra is the dry season settlement and mostly near to the river banks to use the water and available pasture in the river banks. And the Ona Arfasa is spring season settlement and which is in between the upper lands and river banks.

2.1.2 Conceptualizing Drought

Drought affects the livelihood of pastoralists and in turn their responses to cope the conditions. There are different opinions in defining draught. Wilhite and Glantz (1985) defines drought in to four ways (a) meteorologically (b) agriculturally (c) hydrologically and socio-economically. Pratt, Le Gall and D Haan (1997) suggest a draught can be said to occur when rainfall below half the long-term average or when rainfall in two or more successive years falls 75% below average. Coppock (1994) defined drought as "...when two or more consecutive dry years occur in which the length of the growing period (LGP) is less than 75 % of the mean, i.e., a drought is driven by several consecutive rainy seasons which deficient rainfall (with) detrimental effects on the production system." The Society of Range Management (1974) defines as prolonged dry weather, generally when precipitation is less than three-quarters of the average rainfall. The major criticism forwarded in using meteorological criteria in defining drought rests on the limitations of so called normal percipitatpion of area.

With respect to agriculture drought is the stress that causes plants to wilt or die, lowers production. This is attributed to on not only amount and distribution of rainfall, but also a function of other influential factors such as temperature, soil characteristics and management of the land. Vegetation cover and vigor in a given area can provide valuable indicator of meteorological drought. Degraded areas are very much prone to physiological stress and drought is likely to recur. This explains in part why pastoralists living in poor Condition or degraded areas are affected by recurrent drought. Hydrological drought is largely concerned with underground and irrigation water supply. The socio-economic drought is hard to define the terms or indicators due to its relationship to human dimension to access to goods and services, etc.

Tolumin (1995), set drought cycle into three phases derived from pasture production, livestock numbers, grain, and livestock prices. In the first phase, there is an imbalance between livestock numbers and available forage, as drought hits harder, grain prices rise and livestock price decline.

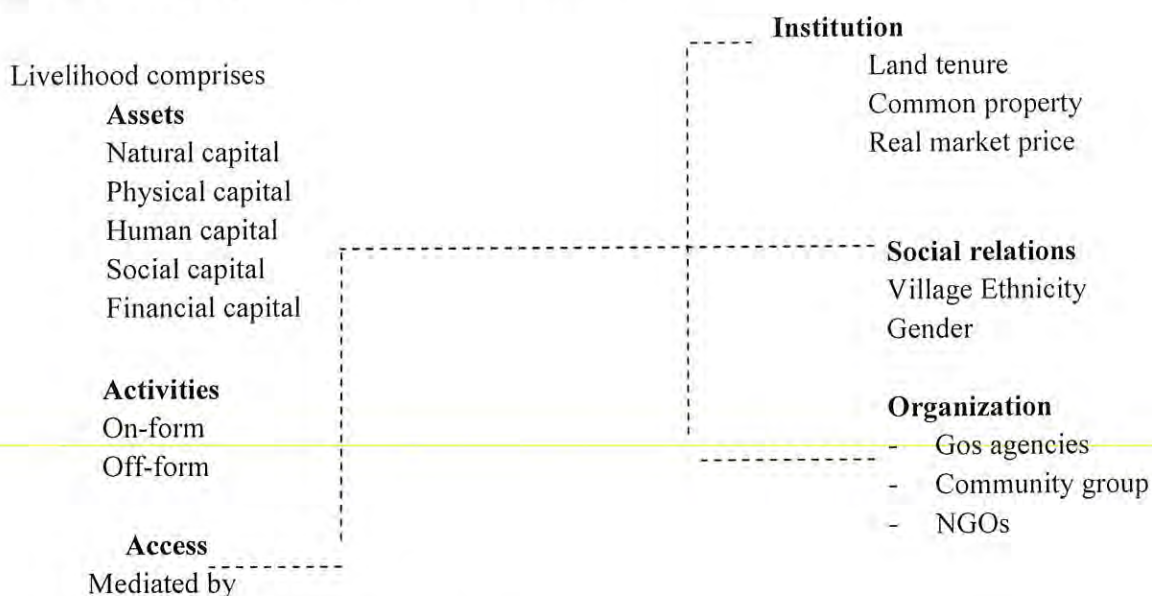
The pastoralists are forced to sell their animals. The second phase is the bottom of the drought cycle. Here herd numbers continuously to fall as a result of sales and deaths despite the leveling off and gradual improvement of fodder availability due to onset of rainfall. The third phase is characterized by recover of previous drought, but livestock numbers remain well below the effective sue of available grazing as in pre-drought. Poor households in this phase may be forced to sell their animals, due to food shortages. Some pastoralists may become destitute and have to depend on food aid. To reconstitute their stocks, here the pastoralists are facing high price of livestock especially young breeding stock.

Several authors suggested that Toulin's view is limited to the fact that effect of meteorological drought and its context differ in terms of spatial dimension and time span. Nevertheless, it provides a general framework on the contexts of pastoralists' economy that is likely to occur during drought. Other point that needs emphasis is that both pre- and post-drought assessments are important in designing effective signals for drought and appropriate interventions.

2.1.3 Conceptualizing Livelihood

The basic concept of livelihood is widely and frequently used in the contemporary poverty and rural development literature. Despite the existence of many definitions of livelihood, its meaning often appeared to be elusive. Chambers and Conway (1992 as cited in Ellis, 2000, P.7) for instance, defined livelihood as it “comprises the capabilities, assets (stores, resources) and activities required for a means of living”. But later on, seeking to give more embrative concept by bringing the claim and access issues, Ellis (natural, physical, human, financial and social capitals) that together determine the living gained by the individual or household”. A livelihood is suitable when it can cope with and recovers from stress and shocks and maintain or enhance its capabilities and assets both now and in future while not undermining the natural resource base (Scoones, 1998). Alternatively, Ellis and Edward (2004) explained livelihood graphically as indicated in Figure 1

Figure 1: Graphic explanation of livelihood definition.

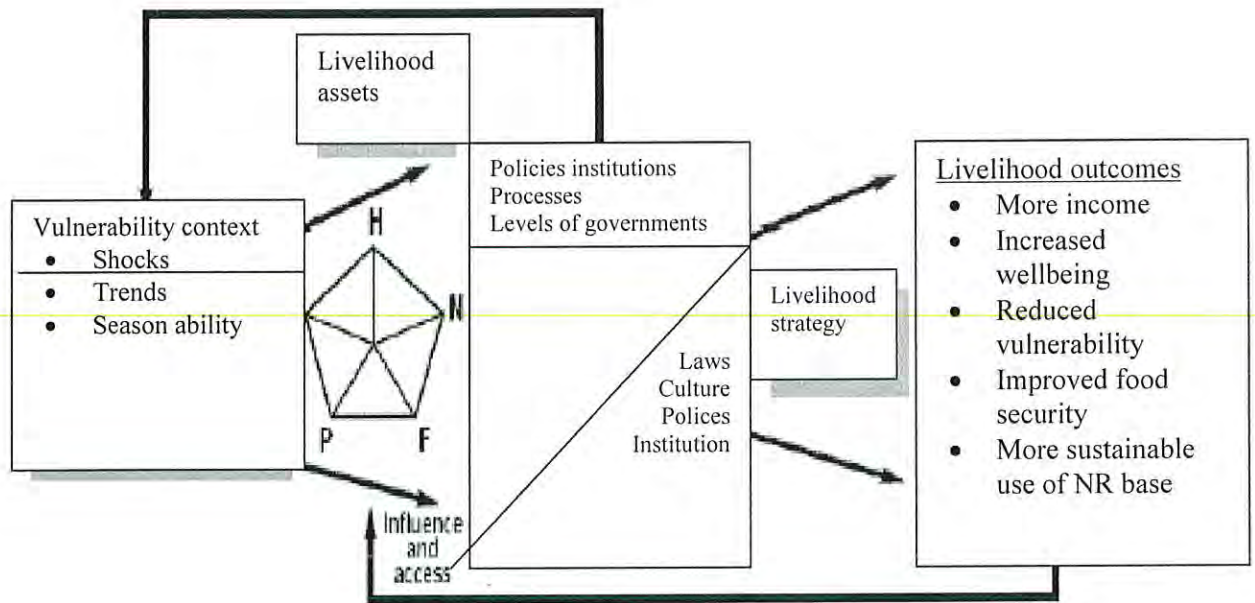


Source: Ellis and Edward (2004, P. 24)

2.1.4 Pastoral Livelihoods

As defined previous a livelihood is defined as the capabilities, assets and activities required for a means of living; a livelihood is sustainable when it can cope with, and recover from, stress and shocks, maintain or enhance its capabilities and assets, and provide sustainable livelihoods opportunities for the next generation (Chambers and Conway, 1992). The livelihoods approach provides a dynamic and holistic framework for understanding the interaction between the bundle of assets – human, natural, financial, social, physical, that people own, control or have access to, and broader systems of governance, to determine if and how people are able to use these assets to pursue their livelihood strategies to achieve positive livelihood outcomes (as illustrated in Figure 2, positive outcomes includes more income, increased wellbeing and reduced vulnerability).

Figure 2: The Sustainable Livelihood framework



Key: H-Human capital; N-Natural capital; F-Financial Capital; S-Social capital; P-physical capital
Source: Chambers and Conway, 1992

A livelihoods analysis helps us to understand the livelihood options that people have over time by exploring the linkages between people's livelihood assets and strategies, and how these strategies are influenced by formal and informal institutions and processes (PIPs) within the vulnerability context in which people operate. According to Chambers (1989 as cited in Ellis, 2000: P.7) vulnerability of households or population groups to a particular disasters have two aspects. The first is the external shock and the second is people's capacity to cope with the shock. Vulnerability may be related to particular livelihood systems, to wealth status, or people's social or political status'. Vulnerability is often seen as the other face of resilience: a group of people is vulnerable when it lacks the resilience to resist external shock. For pastoralist communities five livelihood assets can be identified: Human (education, health, and nutrition), Natural (grazing land, water sources), Financial (livestock, credit), Social (livestock, community, and social support), Physical (livestock herd, infrastructure).

To attain positive livelihoods outcomes, pastoralists rely on specific strategies to manage their livestock effectively. Their livelihoods strategies have evolved over centuries in response to the local environment and the hot and dry climate in which they live, with low and erratic rainfall typical of the arid and semi-arid lands (ASAL). Key strategies include accessing and managing natural resources, mainly grazing land and water sources, and maintaining high levels of mobility across large tracts of land to make the most effective use of scarce resources and in response to environmental conditions (Markakis, 2004; Desta et al., 2008). These sophisticated and dynamic strategies have allowed pastoralists to cope with the threats and risks that characterize their environment and to maintain a viable production and livelihoods system. Drought is a major external shock and a primary trigger of livelihoods crises of pastoralists. Three Cyclical droughts are a defining feature of pastoralists' way of life in HoA, and 'local livelihoods are sensitively adapted to the certainty that drought will come and can be overcome' (UN OCHA, 2006).

In recent decades, however, it has become increasingly clear that pastoralists' strategies have been significantly strained and pastoralists' adaptive capacity to resist or recover from drought-related shocks has been progressively undermined. There is a general consensus in the literature that the chronic vulnerability that characterizes many pastoral groups in the horn of Africa (HoA) today is not merely related to environmental stresses but is the result of complex and multidimensional political, economic and social processes (Markakis, 2004; Kandagor, 2005; HPG, 2006; UN OCHA, 2006; WISP, 2008; Morton, 2008; Oxfam, 2008). In particular, the long-standing Political marginalization of pastoralist communities in the HoA is widely recognized to be a primary factor in their chronic vulnerability (Oxfam, 2008/7; Markakis, 2004; HPG, 2006; Morton, 2008). The PIP element of the livelihoods framework is especially relevant here. As highlighted above, the relationship between the PIPs and people's assets is mutually reinforcing. The assets that pastoralists own, access and control determine their ability to influence the PIPs; in turn, the natures of the PIPs – both formal and informal – influences the way pastoralist groups' access and govern their livelihoods assets and the strategies that they adopt to pursue their livelihoods. Adverse policies and practices, unresponsive formal institutions and persistent negative perceptions of pastoralism have progressively weakened pastoralists' livelihoods strategies. Their mobility and access to key natural resources has been severely restricted, and their ability to manage their livestock effectively has been repeatedly undermined. As a result, their livelihoods system is increasingly vulnerable to external shocks.

2.1.5 Pastoralists' Response Mechanisms to drought: Dynamics of pastoral mode of life

Pastoralism is a rational, adaptable, tried, and tested production system uniquely suited to the dry lands. Pastoralism developed autonomously across the world's dry lands from some 7,000 years ago (Brooks, 2006). It is still widely practiced today and remains a dominant feature of rural East Africa. Pastoralists live in some of the harshest, most climatically variable landscapes, and many still manage through undertaking responses to exercise their traditional way of life mostly through livestock production.

Drought Coping strategies are bundle of people's responses to declining food abnormality entitlements in abnormal seasons or years (Davis, 1993). It is an immediate response to short term and in-habitual decline to access to food, and means to act to survive. Most Pastoralists inhabit areas of low and variable rainfall that have high drought frequency and they generate most of economic goods through livestock activities rather than that of crop farming. For this purpose, they have developed their own mechanisms which would help them to mitigate the adverse effects of drought (adopted from Webb & Braun, 1997).

Until recently, pastoralists have been employing adaptive mechanisms that varied from mobility to herd diversification and exploiting micro environment. According to Sandford and Habtu (2000), mobile pastoralists that can optimally exploit spatial variation in rainfall and consequent vegetation, those who exploit patches of lands and vegetation suitable for their respective stocks, those who use the community network in times of severe crisis and those who maintain different species of herds have a high degree of sustaining droughts in the pastoral areas. When it comes to the reality in the ground, the pastoral societies of Ethiopia are very heavily dependent on income and food from livestock and none of the major pastoralists (Somali, Afar, Borana, and Kereyu) have diversified properly their economy to a significant degree and spread risks of natural as well as man-made calamities (Sandford & Habtu, 2000).

How can pastoralists live with such hard-to-live environments for a long time? Some authors have of the opinion that pastoralists have a better chance of adapting to hardships of natural calamities. Futterknecht (1997), for instance, stated that pastoralists living in marginal areas have much better to cope with drought periods than those who live in relatively better environments as the former ones are used to live within little food for longer dry seasons of the year. In the present

day, to mitigate their livelihood from drought and non-drought adverse effects, Pastoral and agro-pastoral communities employ various coping strategies through undertaking a set of pastoral and non pastoral activities. Pastoral activities include mobility, herd diversification, herd splitting, reduction of consumption and social support. Non pastoral activities include, opportunistic agriculture, collection and selling of firewood and charcoal, petty trade, casual labor and use of wild fruits (Kinyangi, 2008; Aklilu and Alebachew, 2009).

In the present day, the extents of responses to both pastoral and non pastoral activities are in an increasing trend due to the increase in severity and frequency of drought. Response usually refers to the drought risk reduction; through undertaking the above mentioned various response mechanisms (Anderson et al., 2008; Aklilu and Alebachew, 2009). Response can lead to adaptation for groups able to protect and increase assets, but can be a vicious spiral towards poverty (destitution) for the poorer through scattered efforts in low-skilled, low-income, broad-spectrum casual employment (Little, 2001; Homewood, 2008; Homewood and Chevenix-Trench, 2008). Often, returns are insufficient for the destitute pastoralists and agro-pastoralists to invest in rebuilding household assets (Homewood and Chevenix-Trench, 2008)

In the present day, increasing numbers of pastoralists are losing their livestock assets because of drought which are resulted in forcing many pastoralists to leave livestock rearing. The combination of natural (increased climatic shocks like drought and others catastrophic) and manmade factors (conversion of pastoralists' dry season grazing land to other land uses), and a lack of other viable livelihood options pushes more and more pastoralists out of the system. Whereas drought shocks are outside the realm of control, policies and the provision of livelihood alternatives are not. Pastoralists' inherent adaptive capacity and recently highly increased extent response strategies, which has enabled them to adapt to climatic variability for centuries, is increasingly being compromised by policies which aim to sedentary and modernize their livelihood system, ignoring the vital need for mobility and resource access. Pastoralist mobility is vital to maintaining healthy livestock herd sizes, where livestock represents wealth and to a large extent food security, and ensures resilience in the harsh environments of the dry lands. Loss of livestock assets below a certain threshold translates into poverty in the absence of viable alternative livelihoods. Increased poverty, pressure on settlements and urban areas, displacement and conflict are common results of loss of livelihood without the option of viable alternatives.

In addition Wealth affects the ability of people to respond to drought stress. Wealth, among pastoralists, can either be in the form of numbers of livestock (i.e. asset wealth), or access to productive farm land and better wage-paying jobs made possible through education (often secondary and postsecondary education), which safeguards livelihoods irrespective of herd size (Little et al., 2008). Larger herd sizes or better stable income improve resilience and enable pastoralists to flexibly respond to challenges. However, larger herd sizes require space and mobility, and better stable income (irrespective of herd size) requires access to 'alternative' livelihood options which allow alternatives to livestock-keeping, such as agriculture, education and skills development.

Many pastoralists are less able to respond to challenges and become destitute due to a lack of asset wealth and due to lack of alternative livelihood sources, which would allow them alternatives outside livestock-keeping (Little et al., 2008). However, both rich and poor engage in pastoral and non pastoral activities to cope with the change and to safeguard livelihoods. The main difference is that, whereas diversification is a positive investment for the rich, allowing them to generate income and keep herds (if they so choose), or leave pastoralist altogether at no cost to themselves or to others, the poor are forced to scatter their efforts in low skilled, low-income, broad-spectrum casual employment, to meet household needs and to rebuild herds. At a certain point, if households own a number of livestock below a critical threshold, casual labor and petty trade do not allow them to meet the needs of the family and build up herd size at the same time, resulting in a vicious cycle of poverty (destitution) and entrapment in casual unskilled labor (Homewood, 2008), increasing the load on settlements and prohibiting their return to livestock rearing.

As the result of differential in capacity of responses to drought as it is seen from the Figure 4 pastoral livelihoods are in a flux (in dynamics). Those who are able to respond positively to drought is perpetuating in the pastoral mode of life and those who are not able to respond positively are on the extent of leaving the system and others are in transition (agro-pastoralists).

When pastoralists are allowed to practice their traditional livelihood, unhindered to rebuild their herds, they need not be poor. In fact, they are better-off and more secure than settled pastoralists (Little et al., 2008). Also, if they are given options out of natural resource-based livelihoods, they are also less likely to fall into poverty (destitution). This second option of providing viable

alternatives independent of livestock, and even independent of the natural resource base altogether, is becoming increasingly important because population is increasing, climate is becoming increasingly variable, and a healthy pastoral system depends on human and livestock numbers being commensurate (Kirkbride and Grahn, 2008). Pastoralism as a livelihood will be a viable option for many in the dry lands, but others will require access to alternatives. These situation showing as the pastoral livelihood system is in a dynamics or in a flux due to the distortion in the patterns of drought that is aggravated by the climate change and lack of capacity to undertake appropriate responses.

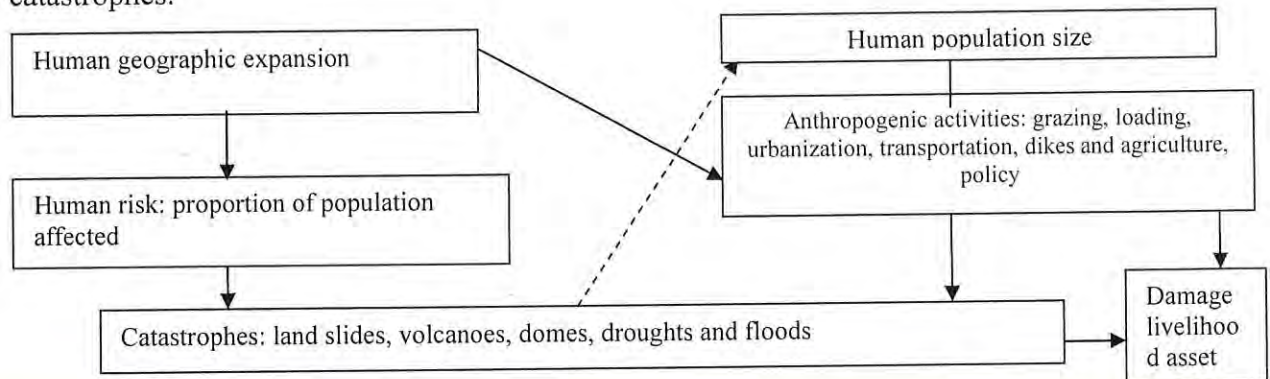
Figure 4 shows how the cumulative effects of natural and manmade factors declined the inherent responsive capacity of pastoralists and lead to a depletion of pastoral livelihood system. Transition away from pastoralism can have different outcomes. Under the circumstances of drought that is aggravated by the climate change there is increasing stresses on the system, the rate of destitution is likely to increase unless options which enable responses, adaptation and a choice of livelihoods which allows people to maintain or improve their conditions independent of livestock-keeping.

2.1.6 Natural Disaster

Natural disaster is the disasters that are caused by the natural process. However, there is a synergistic interplay between nature and human actions as human population increases. The geographic and cultural landscapes of this planet have changed dramatically, altering the interactions among humans. As the human population grows, it expands into increasingly fragile environments; intensifying impacts of natural disturbances (see Figure 3). The barrage of natural disasters around the world highlights vulnerability to the forces of nature such as volcanoes, earthquakes, landslides, drought, flood, fires. This has direct and indirect impact and result in reducing livelihood (adopted from Del Moral and Walker, 2007).

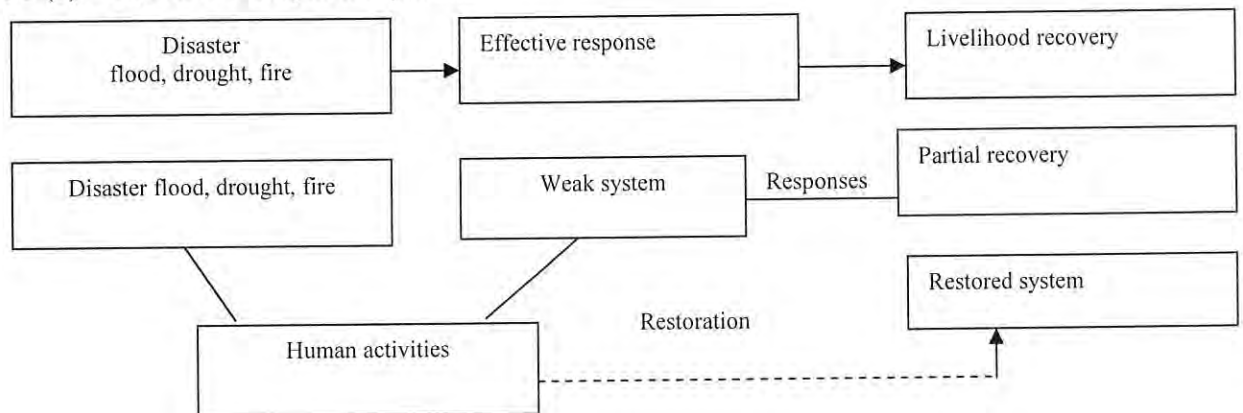
The first, and most tragic, loss from any natural disaster is both loss of livelihood and human life. Costs for the mitigation of the impacts from these events are staggering, jobs are lost, people are driven from their homes and resources are devastated. Efficiency and productivity of natural ecosystems is also damaged. Increasing in frequency and severity of natural disasters has a cumulative, destructive effect on natural resources (adopted from Keys, 2000). Human activities exacerbate natural disturbances and create novel ones on increasingly large scales (see Figure 4).

Figure 3 (a). How natural and manmade factors intensify the disaster effects of natural catastrophes.



Source: Adopted from a crescendo of disasters of De Moral and Walker (2007)

Figure 3 (b). Models of Ecosystem Dynamics



Source: Adopted from models of ecosystem dynamics of Diamond (2005)

As it can be seen from the Figure 3(b) when disasters followed by functional responses, leads to full recovery and also Figure 3 (b) indicates how man made factors intensify disasters, permitting only partial recovery, often to a degraded form. The key to being able to meet the challenges posed by natural disaster is an understanding of viable responses. The situation of responses describes how livelihood systems repair themselves after disaster (Diamond, 2005)

As it is seen from Figure 3 (b) even though disastrous such as flood, drought and fire are occurred livelihood is recovered from the effects. In this case, there is no external or manmade factor that challenge the responses that resulted in livelihood recovery which implies that there is no restriction of livestock mobility, no any dry season grazing pasture land is encroached from pastoralists by external bodies, and there is strong customary institution and also no conflict in the neighboring population (adopted from Diamond, 2005)

However, as shown in other part of Figure 3 (b) in this model there is an external interference. Responses that are undertaken may or may not result in full livelihood recovery. There is a man made factor that are determinant for the full recovery of the livelihood system. In this case the situation may or may not allow opportunistic mobility of livestock which have positive outcome in the dry lands. The customary institution may be declined and dry season grazing land may be used for other alternative or other blue print solution may be practiced. Hence, the livelihood restoration is under question and depends on the situation of external factors (adopted from Keys, 2000)

2.2 Empirical Review

Experiential literature of pastoralists in Ethiopia and their challenges are reviewed from relevant sources and displayed as follows.

2.2.1 Pastoralists in Ethiopia

Pastoralists in Ethiopia are mainly found in low land areas of Afar, Somali, Oromia and the Southern nations, Nationalities and People's (SNNP) regional states (Copock, 1994; Hogg 1997b; Sandord and Yohannis, 2000). Pastoral groups are also found in Gambela and Benishangul areas. The majority of these are pastoralists engaged in extensive livestock herding. With in and between each of this group there are different adaptive specializations depending on varying ecological, economic and cultural factors. The main livelihood system of pastoral areas includes pastoralism, farming and ex-pastoralism those who have dropped out of pastoralism and now survive on petty income-earning activities (Behnke et al., 2007).

The pastoral area of Ethiopia is rich in different type of precious flora like gum, and fauna such as wild life, birds, and aquatic life forms are also found. Besides, the pastoral areas are rich in water, mineral, energy, lakes, and aquatic resources. In Afar the presence of large amount of salt and potash could be good examples. With distinct socio cultural heritages, the 29 ethnic groups, inhabiting the area add to the richness of the environment. The pastoral population occupies a disproportionately large area of Ethiopia and produce much more than its share of national livestock output. Livestock in pastoral regions estimated to 40 % of the country's total livestock population. According to FAO (2008) rangeland of pastoral areas constitutes 63 % of Ethiopia's land area. The ministry of agriculture estimates that pastoralists use 60 % of the country's land area) and own 73 % of its goats, 25 % of its sheep, 20 % of its cattle and all of its camels.

However, precise livestock population is unknown since there has been no stock census for the last three decades ((MOARD, 2008). About 90 % of livestock export of the country comes from pastoral areas (Sentayehu, 1996; Hogg, 1997; Sandford and Yohannes, 2000). Livestock in these areas also supply almost all unofficial exports across the borderlands where animals are first trekked to the neighboring countries and re- exported to the Middle East (Sentayehu, 1996, Teggenye et al., 1999). In the present day, Pastoral areas are continuously challenged by both natural and manmade factors and poor social – economic service provision and poor infrastructure development.

2.2.2 Challenges to Ethiopian Pastoralists

Factors challenging the lives and livelihood of the pastoralists in Ethiopia are multifaceted, deep rooted and complex among which recurrent and prolonged drought, adverse effects of development intervention and poor social and economic service provision and poor infrastructure development are the core factors that are seriously challenging the pastoralists in the lowland areas of the country.

Recurrent Drought

As many studies have shown, drought used to recur with in 6-8 years of the preceding crisis in northern Ethiopia, and within 8-10 years in the country as a whole. But now the occurrence of drought is every year in drought-prone areas of the country and has an established fact though it varies from place to place and from time to time in magnitude and coverage. Drought can persist in one area, occur in some places repeatedly and also expand into new areas. Its nation-wide occurrence can assume different scenarios, of which the following four combinations are considered the worst (Melakou, 2000).

1. *The peak drought of each region is occurring simultaneously in the drought-prone areas in the first of two successive but declining drought years.*
2. *Two successive drought years in the drought prone areas that will increase to the level of the peak drought years of each region in the second year.*
3. *The peak drought of each region will occur simultaneously in the drought-prone areas for two successive years with the same level of intensity.*
4. *Any combination of the above scenarios with new areas will come under drought.'*

The first drought recorded in Ethiopia occurred in the 9th century, followed by the 12th century-drought that resulted in death of many cattle. After that many droughts associated with severe famine occurred between the 16th and 18th centuries (1520, 1540, 1559, 1635, 1668 1707, 1752, and 1772), (See appendix II of Ethiopian severe drought year). The 1888-1892 famine was

unprecedented in the mass destruction it caused. For example, drought and heavy infestation of pests (army worm, caterpillars, etc) created horror among the population, destroying about 90% of the entire cattle and 1/3 of the whole population. After this gruesome disaster, many droughts of various magnitudes have occurred, especially in pastoral areas of Ethiopia. The worst ones, since that of 1888-92, were those of 1973/74, 1984/85 and 1995-97 (Cousins and Upton 1988 b; Helland, 2000; Sand ford and Yohannis, 2000; Melakou, 2000; Fasil et al., 2001).

The 1973/4 drought resulted in 72 %, 45 %, 34 % and 37 % loss of cattle, sheep, goats and camels population, respectively in Afar. The 1983/85 drought started in 1980. In the years 1980 to 1984 there were successive belg (short rainy season) and meher (long rainy season) rain failures, characterized by total absence and erratic nature. Hence, in 1983, the number of people affected by drought in the country reached 3,423,000. The 1983-85 droughts led to a 60 % decrease in cattle population of Borena. The worst drought in recent years (2002/3, 2005/6, 2007/8) have severely affected pastoral areas of the country and it is covering almost all of the drought-prone areas of the country. Many traditional hand-dug wells, temporary rivers and ponds have dried and leading to water shortages for both human and livestock consumption. And also caused shortage of pasture and resulted in loss of livestock. For example in 2002/3 drought karrayu pastoralists lost 45 % of their livestock and Afar livestock holdings declined markedly up to 50 % (UNDP, 2002). The 2007/8 drought caused mortality of 100,000 head of livestock and unprecedented humanitarian crisis on the Borena pastoralists (FAO, 2008).

Those drought affected people, especially, those who lost all or most of their assets/stocks during the previous famine usually do not own anything at all, or enough to restart their lives properly by being productive as they ought to be. Recovery from the droughts shocks and rebuilding of assets/ stocks mainly takes a number of years, however, hard they may try. When the next wave of drought occur before the people have properly recovered from the previous hit, it force the people to use the regained meager assets and throw them back into worse conditions, cutting short any chance for resilience (Melakou, 2000). The situation is currently, worse for pastoralists; Pastoralists depend on livestock and livestock productions for their survival. Unlike sedentary farmers, they have narrow income diversification opportunities. Furthermore, they have been marginalized from the national development programs until very recently (PFE, 2006).

Drought has now become a frequent phenomenon in the country, and all farming systems, especially, the pastoral sector, are seriously affected by the adverse effects of drought in the present day. Pastoral societies are more vulnerable to drought impacts, and every drought event easily turns to famine, resulting in livelihood crises. As a result of drought, crop and fodder production gets reduced, livestock mobility increases, human starvation sets in, and then migration begins and, finally famine hits.

Development Intervention

Pastoralist in Ethiopia in the near past was depicted as a very efficient and self sustained way of life; their mode of adaptation and production is also best suited to a sort of unsteadily environment in which the pastoralists live. The pastoral production system has to do with highly fluid production systems and highly adaptable to the arid and semi arid rangeland environments. Because of this, the pastoral production system more of depends on the large tracts of land so as to get the advantages of potential water and grazing resources (Getachew, 1999).

Before the intervention of the large scale commercial farming in the Awash valley, the pastoralists secure their basic needs through livestock production. Above all their traditional mobile production system, land tenure, social and political institutions are more efficient in mitigating environmental degradation and conflict, which has been instigated from the exploitations of the seasonally available water and vegetation resources (Getachew, 1999; Nyambi, 2001; as cited in Annille, 2009: P.12). However since the last six decades, especially, during the Derg and imperial regime different development projects were planned and implemented in the pastoralists areas of the Awash valley. These development of the large commercial farming, which was mainly aimed for the transformation of the pastoral land use through the introduction of the state sponsored large scale commercial farming and rangeland development projects which were intended to absorb the traditional pastoral economy as to meet growing demand for live animals and low price meat in urban and export market (Ayalew, 2001, P.75), and the demarcation of the forest attractions areas for promotion of the tourist industry by expropriating the large tracts of the flood fed dry and wet season grazing land.

The grave consequences of development intervention such as increase in severity and frequency of drought, deterioration of traditional rangelands, indiscriminate water development, privatization of grazing lands and water resources, large and small scale irrigation schemes have

led to the shrinkage and the declining of the rangelands. For example in Borana the expansion of farm by informal settler and water development undertaken without taking in to consideration of local situation led to the deterioration of range lands and in turn affected the livestock production and productivity. In addition, in the present day, 75 % of Borena range land was invaded by thorny bush of various *Acacia* species (Coppock, 1994; Helland, 2000; Boku, 2000; Tarakegn, 2007; Aklilu and Alebachew, 2009). And also more than 75 % of Afar and Karrayu range lands are invaded in the present day by different indigenous *Acaia* species and exotic ***Prosopis juliflora***. Dry season Grazing land has been taken away from pastoralist s' for other purposes such as for commercial farming and settlements along pastoralists migratory routes. For exemple Conservation Park and commercial agriculture appropriated more than 50,000 hectares of Karrayu, 353,730 hectares of Afar, 62,300 hectares of SNNPR and 50,610 hectares of Gambela, 417,000 of Somali, 1.3 million hectares of Borena Pastoralists' dry season grazing land. In general, in the past 60 years pastoral areas were lost more than 2.6 million hectares of their prime grazing lands by development interventions (Beruk, 2007).

Adverse effects of the development intervention in the Karrayu pastoral group caused reduction of the natural resources base, disruption of seasonal mobility and deprivation of access to water and the displacement of the pastoralist from their ancestral lands. According to Asefa (2000) and Ayelew (2001), for the declining of the Karrayu land they also attributed the expansion of the neighbors of them namely, the Argoba and Afar. This phenomenon led to the externalization of the pastoralist to the peripheral areas. Consequently, the resource base of the pastoralist has dwindled over time and bit by bit the pastoralist entangled in the spiral of less productivity and increasing impoverishment (Ayalew, 2004: P. 251). In this regard, Degefa (2008: P.162) also argues that the decline of the viability of the pastoral sector can be explained by the interplay right arrangements, and rural policies that have been biased against herders societies.

Different scholars (Leif, 2000; Getachow, 2001a; Getachew, 2001 b) stated that the development plan in the pastoral areas of East Africa in General and Ethiopia in particular are planned from misunderstanding and conscious policies of marginalization based on simplistic assumption. The most common of these are a wide generalization that accusing of pastoralists as they have creating desertification, managing their stock according to irrational economic principles and being technically stagnant and backward, destroying nature (Leif, 2000: 1). This misconception

profoundly influenced the political and economic attitudes towards the pastoralists and the plan on the pastoral mode of production and rather it is highly interested to other forms of mode of production like settled agriculture (Taddase, 2006).

Generally, through time the capability of the pastoral sector to sustain the mobile livestock production together with their mobility pattern is highly affected, traditional institutions eroded and unable to play its role for the sustainability of their production system. This is actually explained by a range of internal and external factors such as the introduction of the large scale commercial agriculture, the delineation of the parks and the tourist attracting areas, conflict with neighboring pastoral or agricultural community as well as other interventions increasingly restricted access to key resources of pasture, water and trough – challenging pastoral areas of Ethiopia.

This has increased pastoralist vulnerability to drought, herd loss and threatens the sustainability of the pastoral production system (Getachew, 1999). In the same vein, these sort of the state sponsored intervention become an instrument for the destruction of the pastoral way of life by promoting changes which has undesirable repercussions on communal resource tenure system upon which the pastoral way of life is founded (as Teddese cited from Bokku, 2000). In addition to the development intervention, the constant threats of armed conflicts, cattle raids, ecological changes like lowering the level of water bodies as well as bush encroachment are the most obvious and immediate causes of disaster for the pastoral livelihood and it fosters the general trend towards a largely sedentary life (Turton, 1995; Osterale, 2008; Aklilu and Alebachew, 2009).

Moreover, the above factors have placed a considerable constraint on the capacity of the rangelands to support pastoralism as a viable livelihood option. As a natural response to the decreasing returns of the pastoral production in the area, many pastoralists in the Awash valley are beginning to diversify their income sources to other non – pastoral subsidiary economic activities, such as wage labor, commercial activities, settled agriculture, fire wood and charcoal production, and others. The pastoralists take part in these activities to keep away from the impact of drought and other undesirable effects (Ali, 1997). Diversification to other nontraditional livelihood activities is the result of the combination of but in general Degefa underscores that the

inability to generate sufficient means of survival from livestock pushed the Urrame people away from the pastoralism (2008: P.150).

Generally, the involvement of the pastoralist in different economic activities, which were outside the domain of the pastoralist economic activities, is explained by different other explanatory factors such as unfair terms of exchange between livestock and cereals i.e. the terms of trade is disadvantageous for livestock products, tenure insecurity and the displacement of the pastoralist are some of the fundamental causes for pastoral livelihood diversification. Nonetheless, most of the economic activities held by the pastoralist tend to be unskilled and financially has been unprofitable (Ayalew, 2001).

Poor Social and Economic Infrastructure

Pastoral areas are very lagged in human development such as education and health coverage. School and health infrastructure are very poor in pastoral areas until very recently. The average education coverage is 13.8 % and 15.1 % for Afar and the Somali in 2009 respectively. This means there are problems of availability and accessibility and also there are problems of quality and efficiency in educational service provision in the pastoral areas of the country. Furthermore, the education system is designed in the same way with the high land areas. Attention is not given to the expansion of mobile school, to develop appropriate curriculums, school calendar, and school infrastructure, cultural taboo towards sending of girls to school, inadequate/lack/ of school furniture, teaching aid, low motivation of teachers due to lack of incentives, shortage of human resources etc are among the factors challenging pastoral areas human capital development (PFE, 2006; Esshetu, 2007)

The pastoral areas are highly challenged due to the lack of appropriate health infrastructure and service. Health coverage in Afar, Somali and SNNP pastoral area were 49.9 %, 40.9 %, and 48.7% in 2009, respectively. The available health facilities are found haphazardly distributed. The major problems of health development are lack of access to health services, maternal mortality, infant mortality, lack of medicines and medical equipment, shortage of human resources, less attention to primary and reproductive health education, harmful traditional practices, and incidence of epidemic resulted from flood, prevalence of HIV/AIDS etc (ibid).

In pastoral areas, water shortage for both humans and livestock especially during dry season is a major challenge. The pastoralists shared the available water with the livestock (SC/UK, 2006). Except during the rainy season water is a critical challenge during the dry seasons leaving to a few watering points such as shallow wells in the valley or bottom lands at the edges of seasonal rivers, birkas (cisterns), deep wells (bore holes) and permanent rivers to remain functional and get to be over stocked by animals. Example the distances between grazing land and water points is 30 to 50 km for Borana (Koppock, 1994). In most of the Ogaden and Haud areas the distance is 3-4 days for cattles, 6-8 days for sheep and goats and 15 – 25 days for camels (EARO and ESAP, 2000; Eshetu, 2007)

The inefficiency and ineffectiveness of livestock marketing in the pastoral regions have been contributing to pastoral food insecurity. In the dry season and drought period, the terms of trade between livestock and cereals becomes unbearable for the pastoral household. For instance, in Borena in the year 1998/9 there was the decline in the price of sheep, cattle, and camel by 38 %, 35 %, and 29 %, respectively. During the same period, the price of sorghum and maize rose by 113 % and 61 % (PFE, 2006). The inadequacy and inefficacy of the veterinary services are a bottleneck for pastoral development. The endemic diseases like CCPP, CBPP, Foot and Mouth Disease (FMD), anthrax, external (tick and mange mites), and internal parasites are causes of low livestock productivity and huge livestock losses (Copock , 1994; Aklilu and Alebachew, 2009).

Pastoral areas are the most conflict prone areas in the country. Pastoralism as a mode of production requires movement across boundaries and with in boundaries for search of water and pasture. This movement when restricted often leads to disputes between pastoralists and other neighboring groups. Most traditional peace forums that were strong enough in gaining acceptance in earlier times have weakened today (PFE, 2006). Hence, conflict in pastoral areas for majority of the pastoralists has been remained the cause for poverty aggravation. The causes of conflict are largely multi-dimensional the major ones however are associated with restricted movement, and range and water resource limitation resulted from the growing expansion of crop encroachment and 'privatization' of prior communally owned water and rangeland resources (Futterknecht, 1997).

The decision makers have low understanding of the pastoral communal range management system. As a result, the pastoralists land were taken unlawfully and turned in to large parks, state

farms, and military camps, which the pastoralists could not benefited out of it (Teffese, 2000). In addition, Government pastoral policy for long holds an assumption that pastoralists resist change, are irresponsive to market and so on. The promotion of alternatives, more efficient use of land, agriculture and tourism has been done at the expense of certain social costs (Tarekegn,2007).

The development of infrastructure in pastoral areas are worse than any other areas, affected their life conditions. The problem of infrastructure is not only a matter of lack but also when available are poorly developed and cannot cater for the pastoralists need. The lack of roads and accompanying flood also prevent the use of clinics and schools available to them (UNDP, 2002; MOARD, 2008). The lacks of road net works are also challenging the pastoralists' access to market. Example in low land remote area of Borana, Afara and Somali pastoralists have no access to legal market and sell their livestock to middle men. This highly affects the income that pastoralists get from their livestock.

2.2.3 Responses to Climate Change

Climate change caused a global average surface temperature increase of about 0.6°C (IPCC, 2001), and current temperatures are predicted to increase further – between 1.4 and 5.8°C by 2100 – depending largely on the level of fossil-fuel combustion. This cause Changes in rainfall patterns and extreme events, such as severe water shortages, droughts or flooding. These events increase the risk of land degradation and biodiversity loss. Climate change and variability have serious implications, impacting on ecosystems goods and services upon which poor people and livestock keepers depend, thus exacerbating current development challenges (ibid).

According to NMSA (2001) and Aklilu and Alebachew (2009), Ethiopia is especially vulnerable to climate change because of its greater reliance on climate sensitive economic sectors like subsistence crop cultivation and livestock production. In addition, a large part of the country is arid and semi-arid and is highly prone to desertification. IPCC'S regional review of the impacts of the climate change has identified three vulnerable areas in Ethiopia: food security, water resources, and health. Drought, famines, epidemics, and floods are also very common concurrences in Ethiopia. In most instances these disasters are associated with climatic variability and change (IPCC, 2001; Aklilu and Alebachew, 2009).

Drought is widely recognized as a major climatic hazard and a key development challenge in Ethiopia. While opinions vary on the severity and frequency of drought in the historical past, recent reports show that drought has increased in frequency and intensity in recent times. Pastoral areas of Ethiopia, particularly, Fantle woredas of Oromia are extremely vulnerable to drought and there have been notable droughts in the dry low land areas of the country over the past several decades (Pankhurst, 1966; Tesfaye, 1988; Webb and von Braun, 1994; Getachew, 2001, Teffese, 2001, Aklilu and Alebachew, 2009). Many (including Quinn et al., 1987, Kaplan, 1988, Tasfaye, 1988, Glantz et al., 1991, Nicholas 1993, Funk et al., 2005; Aklilu and Alebachew, 2009) believe that the Ethiopian drought is caused by El Nino-southern oscillation (a coupled air and ocean phenomena with global weather implications) and sea surface temperature in southern Atlantic and Indian oceans combined with anthropogenic activities.

Flooding is also a problem in many places of the country. Major flood hazards have occurred in 1988, 1983, 1984, 1985, 1996 and 2006 leading to considerable loss of life and property (NMSA, 2006; Aklilu and Alebachew, 2009). For example, the 2006 catastrophic flood led to the death of more than 650 people and the displacement of more than 35,000 people in Dire Dowa, South Omo, and West Shewa and caused huge destruction of infrastructure (NMSA, 2006; Aklilu and Alebachew, 2009). Similar situations were experienced in Afar, Western Tigray, Gambela and the low lying areas of Lake Tena. Associated with the floods acute water borne Diarrhea (AWD) and malaria out breaks has caused many more deaths. On the other hand, changes in temperature and rain fall had many negative impacts on human and livestock health. For example serious disease out breaks including WAD, meningitis and malaria have been reported due to altered temperature patterns and rainfall regimes (Asefa, 1996; NMSA, 2006;, MCmichael et al., 2006; Aklilu and Alebachew, 2009). Changes in disease vector habitats will expose livestock to disease such as schistosomiasis, trypanosomiasis, yellow fever and tick borne hemorrhagic fevers. NMSA (2001) and Aklilu and Alebachew (2009) the growth of the country's economy is highly influenced by climate change, particularly, drought, and indicated the need to take these changes in to account in development policies and programs.

IPPC (2007) and Aklilu and Alebachew (2009) noted that climate change is causing major social and economic setbacks in Ethiopia and urged the need to pay attention to the problem. Indeed, the Ethiopian government has recognized climate change as a threat to its national development

aspirations. Thus the country ratified the UNCCD (in June 1997), UNFCCC (in May 1994) and Kyoto protocol (February, 2005). Within these frame works, Ethiopia prepared national adaptations programs of Action (NAP) against the impacts of climate change and desertification. There are also a number of environmentally oriented policies, strategies and action plans include environmental policy, conservation strategy of Ethiopia, health policy, forestry action plan and disaster prevention and disaster preparedness, and early warning policy. Such policies are expected to contribute to fight against climate change and desertification in the country. However, climate impact mitigation was not translated in to the policies and programs of the country. For instance, environmental policy (1997), water resource management policy (1999), PASDEP (2002), pastoral development policy, environmental impact assessment proclamation (2002), Rural land administration and land use policy and strategy (2004), wild life policy (2004), Forest conservation and utilization policy and strategy (2007), biodiversity conservation and research policy (1998), National policy on Ethiopian women (1992), health policy (1993) and other rural development policies and programs have hardly captured the threat of climate change. In particular, the national policies and programs give limited attention to vulnerable societies in climate sensitive, drought and flood prone areas of the country (Aklilu and Allebachew, 2009).

Responses to drought

Increasing in frequency and severity of drought has affected the length of growing seasons, crop and livestock yields, increased risk of food shortages, insecurity, and pest and disease incidence, putting populations at greater health and livelihood risks. However, in the present day Ethiopian pastoralists have used a diversity of strategies to sustain production by undertaking a various response mechanisms to recent severe drought. These strategies include moving livestock according to vegetation needs and water availability, keeping species-specific herds to take advantage of the heterogeneous nature of the environment to diversifying their livelihood strategies and, in some cases, temporary or permanent emigration (Galvin, 1992; Galvin, et al., 1994). For instance, Borana pastoralists started to rearing camels, Kereyu and Afar pastoralists started to give more emphasis on small stocks and camel than cattle to reduce the effects of drought.

In addition to pastoral activity, in response undertaken to drought that is aggravated by climate change Ethiopian pastoralists have started to undertake non pastoral activities such as business in town (by the middle class and rich), sedentary agriculture, petty trade, children's education, use of informal transfer, reinforcing clan solidarity and provide a social safety net that offers some protection against risks. Informal transfers include the redistribution of food and cash, mainly through remittances or soft loans and the redistribution of productive resources such as livestock and sorghum seeds (CARE, 2003). Others responses that are under taken by Ethiopian pastoralists to drought are reducing the consumption during drought periods, borrowing, eating wild foods, making market purchases and seeking support from relatives (Behnke et al., 2007)

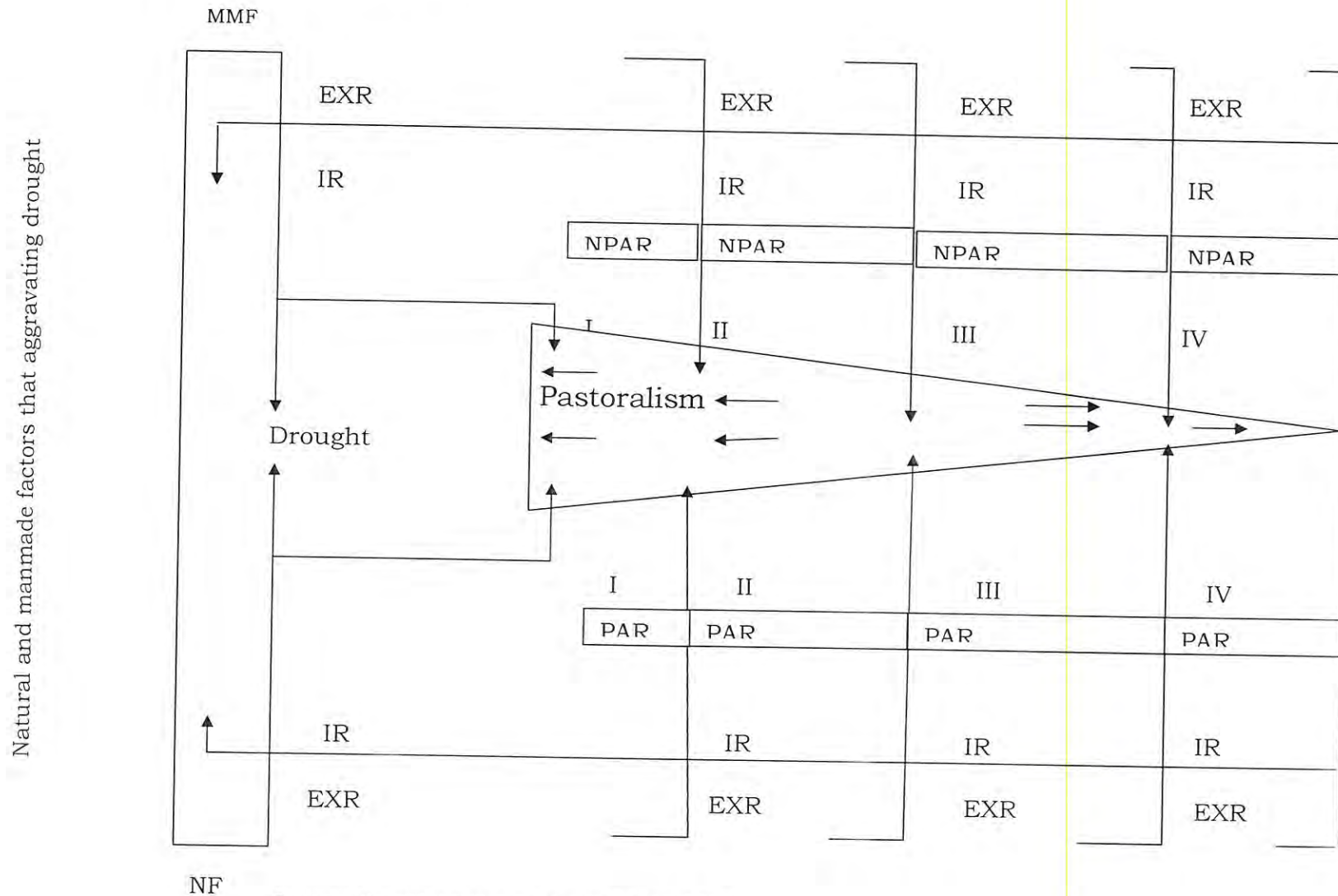
Even though, its progress has been slow, in pastoral areas drought response in Ethiopia is regulated by the government's 1993 national policy for disaster prevention, preparedness and management (MOARD, 2008). And also NGOs have supported the development of early warning systems through drought contingency planning. However, at a local level development and disaster response are still weak and investment in development and disasters management is minimal. Drought response in most pastoral woreda is late. The default emergency intervention is food aid, and livelihood protection is limited (Galvin, et al., 1994).

2.2.4 Conceptual Framework

As it can be seen from Figure 4, which is a conceptual frame work of this study, in the present day, adverse effects of drought is aggravated by both natural and manmade factors on the pastoral livelihood system of the study area. Natural factors include climatic factors such as scarcity of rainfall, increased temperatures, wind pressure; loss of livestock by drought, natural resource /biodiversity/degradation and disease. Man made factors mainly include development policy issues such as curtailment of mobility, conversion of traditional dry season grazing lands in to other land uses, poor infrastructure development, conflict and household characteristics. As it can be seen from Figure 4, Karrayu pastoralists are found at a varied stage of responses in which wealth of the household coupled with the external responses are the decisive factor to put the pastoralists in any one or more of the stages of the responses. In this case, pastoralists those who have undertaken appropriate responses to drought through pastoral and non pastoral activity responses (PAR and NPAR) are mainly found in the I and II stages of responses in the present day. Pastoralists in I and II stage are those who have asset and have a capacity to undertake

appropriate response mechanisms to mitigate their livelihood from the adverse effects of drought that is aggravated by the recent climate change. However, Karrayu pastoralists those who have lack capacity to undertake appropriate response mechanisms to drought through both pastoral and non pastoral activity responses are mainly found, in the present day, in III and IV stages of responses. Pastoralists in this stage are those in great tension or in pressure because of drought and its related effects. Pastoralists in the III stages are those reached the asset disposal stage due to loss of livestock by drought and sell for exchange of grain. Mainly household in this stage are those who their livestock holding is below threshold level. Unless appropriate external responses are facilitated for this group, only their responses (internal responses) are not well enough to mitigate them from adverse effects of drought and to rebuild asset. Pastoralists those are reached the IV stage of responses are the destitute those who lost totally their asset due to drought and related effects and those who are out of any viable productive responses. These clearly show as the dimension of the pastoral mode of live of study area pastoralists are in a continuum fluxes or dynamics due to drought and related adverse effects that is aggravated by the recent climate change.

Figure 4. Conceptual Framework



Source: Researcher's own construction, 2010

Key: NF-natural factors; MMF- Man made Factors; EXR-external responses; IR-internal responses; PAR-pastoral activity responses; NPAR-non pastoral activity responses; I-IV-stages of responses.

CHAPTER THREE

Description of the Study Area

3.1 Pastoral Areas of Oromia

Oromia pastoralists' are found in Borena, Gudji, and low land areas of Bale, Eastern Shoa, Western and Eastern Hararghe zone. In Oromia there are 33 pastoral Woredas and the total population of Oromia pastoral area is more than 4 million, which is more than 14 % of the total population of Oromia. Pastoral areas of the region are classified as a low land area (below 1500 m abs) with average annual temperatures above 25 °C and low annual rain fall which is below 600 mm. *Most of the pastoral areas of the region are characterized by bimodal rain fall pattern in which the main rain fall Ganna is prevailed from March to May; and the second round rain fall Hagaya is prevailed from June to October.* Droughts are among the major natural hazardous that are continuously challenging (with increasing in frequency and severity) the livelihood of the pastoralists' in the region (OPADC, 2003).

The lives and livelihood of the Oromia pastoralists' are highly depending on the livestock and livestock products; and livestock are physical, financial and social capital for the pastoralists' of the region. From the total livestock population of the region, pastoral areas hold more than 20 %. The pastoral areas of Oromia is also the source of where worldwide known cattle breeds of Borena and Kereyu (Fentale) are found which have large economic contribution for the country, high foreign currency earning share next to coffee and have high demand both on international and local market. The area is rich in natural resources such as underground water, minerals, fishery and energy; and the presence of a wide variety of flora and fauna are clear indications of the rich potential of the pastoral areas of the region. The pastoral area of Oromia is more than any other areas of the region, have used the Geda system¹ which is accountable for the social, economic and environmental affairs of their area. However, the promising potential of the dry lands of the region is becoming seriously challenged by both natural and man made factors.

3.1 Location

Fantale Woreda is located in eastern shoa zone of oromia regional state. The woreda is bordered by Amahara region in the north and Argoba woreda of Afar region in the north east and east, and by the Boset woreda to the west, West Hararghe zone to the east and Arsi Zone in the south. The total area of the Fantale woreda is 1339.64 square kilometers.

¹ Geda is the traditional Oromo institution which is accountable for the general social, political, economic and administrative affairs of the society.

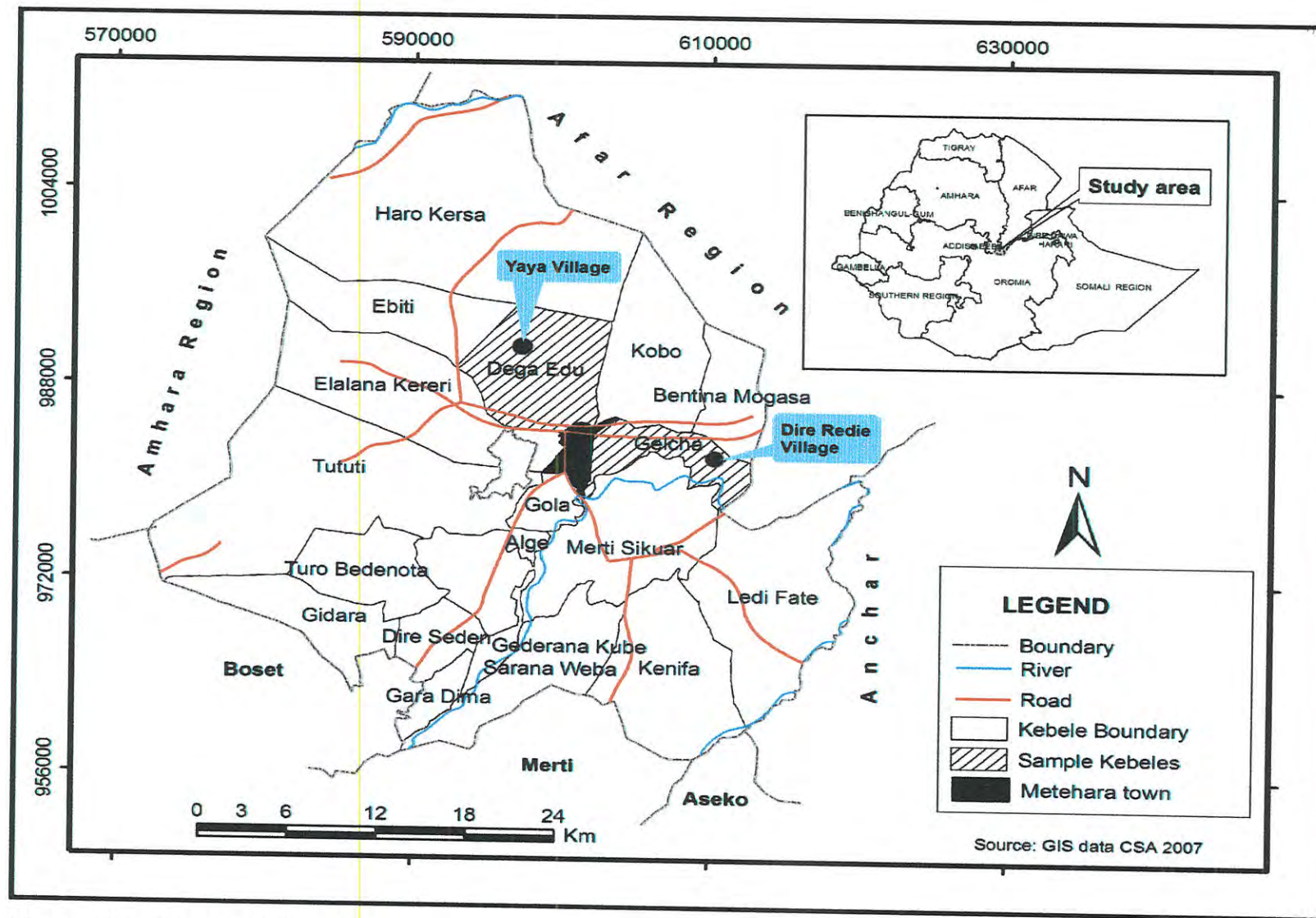


Figure 5 The location of the study area

3.2 Administration

Administratively the woreda has 20 kebeles of which 18 are rural and 2 are town kebeles. The capital town of the Fentale woreda is Matahara where most service centers are stocked and the rest are located at Haro Addi town. These two towns represent the two urban kebeles, which are inhabited by Oromoo and some other ethnic group working in the commercial farm of Matahara sugar factory and urban traders; whereas the rest 18 kebeles are inhabited by the indigenous population of karrayu Oromo pastoralists’.

3.3 Physical Features of the Study Area

According to FAO (2008), Ethiopia’s tropical monsoon climate is subjected to wide topographic variations. Areas with elevation below 1500 m including the Great Rift Valley area are subjected to arid and semi-arid climatic condition. Hence, the Fentale woreda is characterized by arid and semi arid climate. The rain fall of Fantalee district shows a bimodal pattern with three distinguishable rainy season such as the ‘‘Ganna’’, which is the main rainy season between July and September that enables agro-pastoralists to grow maize, teff, haricot bean and rarely sesame . The ‘‘ Furmata ‘‘ which is the shortest rainy season in between November and December is important for the regenerations of browse and shrub vegetation for the livestock, especially, for the browse. And ‘‘Arfasa ‘‘ rainy season which extends from March to April are more use full for the regeneration and growing of grass species (Lamb et al., 2000). The mean annual potential evapo-transpiration logged at Metehara, a capital town of the district which is adjacent to Lake Beseka is about 2560 mm. While the average annual rainfall of the area is 451.3 mm which is low and erratic and uneven in distribution. The temperature of the woreda ranges from 16 °C in the coolest months of the year (July to September) to 38°C in the hottest months (January to June). The mean annual temperature recorded over 24 years in Metehara is above 25°C (NMSA, 2010).

Elevations of the most parts of Fantale district ranges from 900 to 1000 meters above sea level; Mount Fantale which is used for grazing during dry season is the highest peak of the district with an elevation of 2007 meters above sea level (ORADB, 2008). The district is situated in the mid of the rift valley system of Ethiopia and crossed by Kesseme and Awash Rivers through some of the PAs. The soil is predominantly clay and sandy and major soil types in the district are regosols, rendzinas, phaezems, fluvisols, luthosols, andosols, covering 35 %, 28 %, 3 %, 16 %, 12 % and

6 %, respectively (unpublished document of socio economic profile of Eastern Showa Zone, 2009). The soil type fairly describes the whole PA with the exception for the Beseka lake catchments. The geology of the district is characterized as highly permeable composed of volcanic ash, recent basalt and young basalt (Tenalem, 2005a).

The vegetation is complex mix of acacia trees, bushes and shrubs that are common to the low land areas. From the total area over half of the district is degraded land. In addition the Awash national park, and commercial agriculture such as Nura Era fruit and Matahara suger cane plantation encroached more than 50,000 hectares of Karrayyu's dry season grazing land.

3.4 Population

The population of Fantale woreda is 82, 225 (CSA, 2008), of which more than 75,000 live in rural areas and the rest live in the towns and at a commercial farming center. The gender proportion reveals that 53 % (43,579) of the populations are males and 47 % (38,646) are Females. The average population density is 61.37 persons per square kilometers. Currently, the rural populations in the 18 kebeles are occupationally categorized as pure pastoralists, agro-pastoralists, and some sedentary agro-pastoralists (CSA, 1996).

3.5 Economic Activity

Traditional and extensive livestock rearing system is the primary livelihood base of Fantale woreda pastoralists'. According to woreda pastoral development office (2009), the total livestock population of the woreda is 545, 909 (see Table 3). Wealth of the household is determined by the number of the livestock holding such as camel, cattle and shoats. Currently, Camel is the major wealth indicator owned by the middle and rich wealth group. Traditionally, cattle are the major wealth indicators, however, in the present day, severity of drought reverse the situation and Fantale pastoralists' are making more emphasis to goats and camel due to their intrinsic capacity that allow them to escape and tolerate drought hazardous. Donkey is also used as a pack animals providing transportation in rural areas. The basic household asset and insurance against food shortages is livestock. The main food sources for households are livestock products and food purchased from markets through sale of the livestock. Milk is the main staple food and Karrayyu pastoralists traditionally produced milk from cow, camel, sheep and goat. However, in the present day, the production and productivity of livestock has highly declined due to the increasing frequency and severity of the drought and its related adverse effects. Non pastoral activities such

as crop cultivation (both rain fed and irrigation agriculture), fuel wood and charcoal selling, petty trade and casual labor appeared in the near past and have practiced in the present day by the pastoral households as a response mechanisms to minimize the adverse effects of the recent severe drought that is aggravated by the climate change. In addition there are households who are supported by food aid through employment generating schemes such as rangeland management, water harvesting and rural road maintenance.

Table 1.Livestock population of the District

Livestock category	Size
Cattle	160,088
Sheep	131,829
Goats	147,535
Camels	81,204
Donkeys	7,828
Poultry	17,425
Total	545,909

Source; Woreda Pastoral development office, 2009

3.6 Social and Economic Service

Social service provision in the rural area is poorly developed. There is one hospital, one health station, one clinic that are concentrated in the woreda town- matahara that were purposely established for commercial farming center during the Haile Selassi I regime and are hardly accessible for the pastoralists because of distance and pastoralists mode of life (mobility). There are also 3 private clinics in the Metehara town which are hardly accessible for the pastoral community. Even though, the construction of 8 health post (1-type B and 7-type C) are recently accomplished in the rural kebeles and prepared for service provision. All of them were not starting to provide services mainly due to the lack of the skilled man power (WFAEDO, 2001annual report). Currently, 15 primary schools (1-4) and 5 junior secondary schools (5-8) are found in the rural kebele while 2 primary schools (1-4), 2 junior secondary schools (5-8), 2 secondary school (9-10) and 2 preparatory schools (11-12) are in the matahara and Haro Adi town which are hardly accessible for the pastoralists’ children. Education coverage is still low and accounts for only 27.7 per cent. Except the Metehara, the capital town of the woreda where pipe water is available; there is serious problem of water availability and accessibility for both human and livestock population in the rural areas. Currently, only 2 shallow wells and 3 depth boreholes are functioning and provide service in 4 PAs for both human and livestock population.

The rest of the populations depend on distant rivers, boreholes, cisterns and ponds found in the neighbor Woreda (Boset), during the dry season that are accessible only through long journey (> 30 km on foot). In the present day, from the total 10 water points (3 shallow wells and 7 Boreholes) found in the woreda 5 (1 shallow wells and 4 boreholes) were not functioning due to drought. The coverage of potable water supply is currently below 10 per cent.

Furthermore, basic infrastructure such as market, communication networks, and financial institutions are concentrated disproportionately in Matahara and Haro Adi town which were purposely established during the Haile selassi I for the aim of facilitating services for the commercial agriculture and conservation parks centre. Even though, the woreda is crossed by the asphalt road that connects the capital city - Addis Ababa with the Afar, Oromia and Somali regional state, except few kebels that are found on the periphery of the road, majority of the kebeles are connected by community built roads that serve selectively small vehicles during the dry season.

CHAPTER FOUR

Results and Discussions

This chapter presents the major findings and analysis of the study on the patterns of drought, adverse effects of drought on the pastoralists' livelihood base, responses that are undertaken by Karrayu pastoralists to drought, factors that are challenging responses undertaken to drought and available opportunities in responses undertaken to drought by using the primary data that are obtained through household survey, focus group discussion, interviews, case studies, and direct observation and; secondary data that are collected from various sources.

4.1. Background of the Respondent Households

Sex, age, educational status, occupation and income of the respondents' household of Yaya village of Dhega Heddu kebele and Dire Redie village of Gelcha kebele were briefly presented hereunder.

4.1.1. Sex and Age Distribution of the Respondents

Of the 134 respondents, 114 (86 %) are male while the remaining 20 (14 %) are females. The total household sizes of the respondents of both villages were 768 and the average household sizes of the respondents were 5.7. As shown on the Table 2, the age distributions of the respondents range from 22-70 years with an average age of 41 years. Accordingly, the household respondents are grouped in to five classes. From the total respondents 83 (62.8 %) are between the age of 31-50 years and they are active participants in social, economic, and political issues, and more than 80 % respondents are below 50 years.

Table 2. Demographic Characteristics of the respondents (%)

S/ N	Age group	Yaya			Dire Redie			Total		
		Male	Female	Total	Male	Female	Total	Male	Female	Total
1	22- 30 years	21.7	0	21.7	17	0	17	18.6	0	18.6
2	31 – 40 years	26.0	6.5	32.5	23.9	8.0	31.9	24.6	7.5	32.1
3	41 – 50 years	19.6	2.2	21.8	28.4	6.8	35.2	25.3	5.22	30.5
4	51- 60 years	17.4	2.2	19.6	11.4		11.4	13.4	0.75	14.15
5	60- 70 years	2.2	2.2	4.4	3.4	1	4.1	3	1.5	4.5
	Total	86.9	13	100	84	16	100	86	14	100

Source: Researcher's data, 2010

4.1.2 Educational Status of the Respondents

As it can be seen from the Table 3, 91.3 % of Yaya and 84 % of the Dire Redie village respondents are illiterate and 8.7 % of Yaya and 2.3 % of the Dire Redie village respondents can read and write. In general, only 3.73 % of the respondents from the Dire Redie villages have an educational level of above 7th grade while respondents from the Yaya village have no any educational level other than writing and reading. Illiteracy level is high in the pure pastoralists' village (Yaya) when compared with the Agro-pastoralists' village (Dire Redie). It was also found that female household head respondents have never attained any form of education.

Table 3. Distribution of households according to their Educational Status (%)

S/N	Educational status	Yaya			Dire Redie			Total		
		Male	Female	Total	Male	Female	Total	Male	Female	Total
1	Illiterate	78.2	13	91.2	68.2	16	84	71.6	14.9	86.5
2	Read and write	8.7	0	8.7	2.3	0	2.3	4.5	0	4.5
3	Grade 1-6	0	0	0	8	0	8	1.5	0	1.5
4	Grade 7-8	0	0	0	2.3	0	2.3	5.2	0	5.2
5	Grade 9-10	0	0	0	3.4	0	3.4	1.5	0	1.5
6	Above grade 10	0	0	0	0	0	0	2.2	0	2.2
	Total	86.9	13	100	84	16	100	85	14.9	100

Source: Researcher's own data, 2010

According to these respondents, high illiteracy rate was related to lack of awareness of importance of education. There were no schools in their vicinity and education was not considered by their families as the first priority when compared to livestock keeping. However, today all of the households have sent their children to nearby schools and want their children to continue their education up to higher education level.

4.1.3 Occupation of the Respondents

Mode of life or livelihood system of 91.3% of Yaya and 68.2 % of the Dire Redie Village respondents were based on pastoralism while 8.7 % of the Yaya village and 31.8 % of the Dire Redie Village respondents are based on an agro- pastoral mode of life. Even though the extent varies, in the present day, all of the respondents have started crop farming as a response to drought. But they would deem the pastoralism as a worth or as a blessing and even those who get substantial income from agriculture would not like to be entitled themselves as an agro-

pastoralism.² In addition, even for those highly engaged in agriculture, livestock activity generates a lion share of household income still in the present day. Furthermore, average farm size of the household is very low, especially; in the last season farm size is decreased due to late initiation and early cessation of rain fall. Average cultivated land by each household in the Yaya and Dire Redie villages are 1.25 and 1.7 hectares in the last season, respectively.

Table 4. Occupation and Average Farm size of the Households

	Village		Total
	Yaya	Dire Redie	
Pastoralist	42.0	60.0	102
(%)	91.3	68.2	76.1
Agro-pastoralist	4.0	28	32
(%)	8.7	31.8	23.9
Total	46.0	88	134
(%)	100	100	100
Cultivated land in hectare	57.5	176	233.5
Average farming size	1.25	2	1.7

Source: Household survey, 2010

4.1.4 Household Income

Table 5, displayed the household average annual income and its respective sources. It is found that more than 69 % (11,647.02 birr) of the average annual income of the households of the both village were generated from the pastoral activities through the sale of both livestock and livestock products. This indicate that livelihood of the study area is highly dependent on the pastoral activities. More than 80 % of the annual income of pure pastoralists (Yaya village) was generated from pastoral activities and 41 % of annual income of agro-pastoralists (Dire Redie village) was generated from pastoral activities

Table 5. Household annual income

	Yaya	Dire Redie	Total
Average pastoral activity income	6801	4846.0	11647.0
Average non-Pastaral activity income	1226.9091	2997.3	4224.1
Average income from Food aid	548.4783	657.2	1205.6
Total income (average)	8414.3478	8485.3	16899.7

Source: Household survey, 2010

² An agro-pastoralism is one in which more than 50% of household gross revenue comes from crop farming and 10 – 15% from pastoralism (SWIFT, 1988, as cited in Teffese, 2000)

The share of non pastoral activities income to household of both village annual incomes was also significant which was 25% (4224.127 birr) and is modified and developed as a response mechanism against severe drought that is aggravated by climate change. Non pastoral activities such as agriculture, daily labor, petty trade, fuel wood and charcoal selling contribute 14 % (1226.9 birr) to the total household annual income (8414 birr) of the pastoralists' village and 35 % (2997.3 birr) to the total household income of the agro-pastoralists' village. However, expansion of agriculture and destruction of sparse tree for fuel wood and charcoal selling have adverse effects on rangelands; and pose deterioration on the dry land biodiversity. Non pastoral income for the study area is generated from rain fed agriculture, fuel wood and charcoal selling, daily labor and petty trade. High amount of non pastoral income of both villages comes from the rain fed agriculture and selling of fuel wood and charcoal. And petty trade and casual labor have contributed a limited amount of income mostly undertaken by female headed households.

4.2 Patterns of Drought in the Study Area

In the present day, the pattern of drought in the study areas fluctuated from its normal situation. Drought cycle has got shortened, severity of drought is increased, and length of drought month in a year is increasing from time to time. Average annual temperature increased in an alarming rate with great variation in monthly and annual average temperature. Rainfall is low, sporadic and variable. Intensity of rainfall is highly increased and duration of rain fall in the study area is decreasing from time to time.

4.2.1 Past and Present Patterns of Drought in the Study Area

In the past, pastoral areas of Ethiopia have experienced severe drought once every 4 to five years. However, the drought cycle has changed in the recent time and become more frequent, 2-3 years, giving no time to recover from the effects (Coppock, 1994; Anderson et al., 2008; Akliliu and Alebachew, 2009). According to FAO (2008), ever year, at least some parts of Oromia, Afar, Somali and SNNP arid and semi arid areas have experienced a rain fall deficit in the present day. In the present day, the drought cycle is shortened and length of drought month in a year is increased in an increasing trend from time to time and in some years even no any rain is sag for successive ten months in the study area. For example, according to the UNDP field report (2002), in 2002 Fentale district did not receive rain for succesive10 months. FGD, participants explained that in 2002, 2006 and 2008 the woreda did not received rain for more than 10 subsequent

months. Both FGD and Key informant participants elucidated about the patterns of the past and present day drought by comparing the amount and availability of rainfall, water and pasture in their villages/kebele/woreda in the past and in present day. They said that even though drought is normal life style that the kararyu pastoralists' have had tailored to; in the past there was rain and it was plunge in regular pattern in Ganna (long rain season), Furmata (short rainy season) and Arfasa (medium rainy season) season. Grass was abundant and it was fired before the onset of the coming rainfall to facilitate the germination and sprouting of the new grasses. They said that the frequency (cycle) of severe drought was long (4-6 years) and length of drought month was short in the past, especially, pre - 2002. FGD, participants said that there was severe drought during the Haile Selassie I regime in 1947 (locally called Bara xaasa tokicha - meaning unusual increase in cereal price), 1953 (locally called Bara qorqorro - meaning water rationing undertaken by government), 1958, 1964, 1969, 1974, and during the Derg regime 1979 and 1983-85 (locally called Fullasii), and now 1994/95.

Table 6. Percentage of Households responses on the patterns of drought

Patterns of drought	Yaya		Dire Redie		Total	
	Before 10 years	Now	Before 10 years	Now	Before 10 years	Now
Length of cycle of drought year						
- Short		77		74		75.5
- Medium	3	23	7	26	5	24.5
- Long	97		93		95	
Duration of drought month in a year						
- Short	70		83		76.5	
- medium	30	1	17	11	23.5	6
- long		99		89		94

Source, Household survey, 2010

However, they have said that these all were not as severe as of the 2002 and subsequent drought. In the present day, drought is every year and length of drought month in a year is increasing from time to time and whole month in a year is becoming drought, which the Fantale pastoralists called “³Fullaasii”. Karrayu pastoralists severely claimed, once again, 2002 and subsequent drought by saying that we know drought, we live in it and also we know traditionally how to response (how to overcome) to drought but the 2002 and subsequent drought is the special curse,

³ Extremely prolonged drought that extends to more than 9 months without sag of rain

it severely and unusually affected our livestock, all year after an ⁴**Abari of 2002** is drought. Even if it is raining no grass or pasture is germinating and sprouting. An increase in frequency and the severity of the drought declined and affected the germination, growing and sprouting capacity of the grass species; the soil is dried and becoming dust immediately after a shower of rain fall and not holds moisture required for plant growth due to increasing/high evapo-transpiration rate. Household survey results on the patterns of drought also certified the blue print idea of FGD and KII stated above. As it is seen from the Table 6, 77 % of respondents from Yaya and 74 % of respondents from Dire Redie village confirmed that as the cycle of drought in their village in the present day is short. And 97 % of respondents from Yaya and 93 % of respondents from Dire Redie Village confirmed that as the cycle of drought in their village in the past was long. Again 70 % of respondents from Yaya and 83% of respondents from Dire Redie Villages confirmed that length of drought month in a given year in their village was short in the past. And 99 % of respondents from Yaya and 89 % of respondents from Dire Redie Village confirmed that length of drought month in a given year in their village is longer in the present day. This indicates as the both villages are almost equally suffered by the frequency of drought occurrence and length of drought month in a year. In both village drought cycle is long in the past and short in the present day; and in both villages length of drought month in a given year is short in the past and long in the present day.

⁴ A name given to the severe drought of the present day which means curse

Box 1: Case study 1

Baati Gobuu Fantale:

He is a pastoralist from a Yaya village. He is 45 years old. He has 6 children (4 males and 2 females) and prominent one in the society. He said that do not ask me about livestock (horii in local language); I left livestock for a drought. Before 13 years I had more than 45 lactating cows, 11 bulls, 17 heifers; more than 100 shoat and 23 lactating camels. There was abundant milk. During the past I utterly depend on livestock and livestock products and I had shared some of my lactating cows to relatives. The nature of the drought is now absolutely changed, since 2002 it is not the one which we adapted to in the past. We know drought and easily recovered from it but the present one is not drought, it is a fire, it is cruel. If your asset is burned by fire the chance of getting some residual is very low, the present day drought is like the fire, it is affected all our livelihood sources. It has multidimensional adverse effects; it destroyed pasture and drying borehole water, spreading disease of livestock and human; and wilting on the field in a leave stage the crop that I have started as a compensation of livestock products. I lost my camel, and shoat due to disease and my cattle and sheep due to drought. In the past I used *traditional* medicine (plant) to treat my livestock, now this is not available in the rangelands. Increase in frequency and severity of drought destroyed traditional medicinal plants from the rangelands. Now I have only 15 lactating cows, 50 shoat, and 5 camels and milk is hardly obtained, especially during the drought no milk is dived even for children. In the present day I have been started crop farming and during the normal years I have harvested 5-10 quintal of maize. Now I make prominence to goats and camel rearing. Unlike earlier I have not only devoted on the livestock. I have undertaking livestock trade; I buy and sale after some time. I thought that promising only pastoral activities in the present day is ruthless, it put you under calamity.

4.2.2 Severity of Drought in the Study Area: Magnitude of Hotness and Wind Speed

In the present day, in the dry land areas people describes living through long periods of heat and burning sun, dry weather which is raining steadily, punctuated, by down pours that accompanied by very strong winds, thunder, lightening, and destructive hailstorms (Anderson et al., 2008). In the present day, the study area is characterized by severe drought in which the hotness of the sun is extremely scorching; and both human and livestock could not able to withstand the hotness of the sun scorch and its related adverse effects. Both FGD and KII, participants said that the sun is too scorching and both people and livestock could not able to tolerate the severity of present day drought and its related adverse effects. They said that here before karrayu pastoralists promised in some extent goats and camels in their capacity to escape and tolerate the recent severe drought. But in the present day camels and goats could not able to tolerate and escape; due to the severity of drought is highly increased and the length of drought month is extremely prolonged. They explained that when the severity of drought is prolonged; the hotness of the sun and the lack of normal cold water for a long period of time is heavily affecting the head of the goats (lack of

ability to keep balance) and resulted in folly and immediate death of the goats (locally they called jinni). They said also the severity of drought caused unknown disease of camel and resulting in loss of camel (see the detail in section 4.4).

Table 7. Household responses on the severity of drought or hotness of the sun and wind speed (%)

	Yaya		Diree Redie		Total	
	Before 10 years	Now	Before 10 years	Now	before 10 years	Now
Severity of drought or hotness of the sun						
- low	4		6		5	3
- moderate	96	6	94	8	95	7
- High		94		92		93
Magnitude of wind speed						
- low	84		76		80	
- moderate	16	8	24	12	20	10
- high		92		88		90

Source: Household survey, 2010

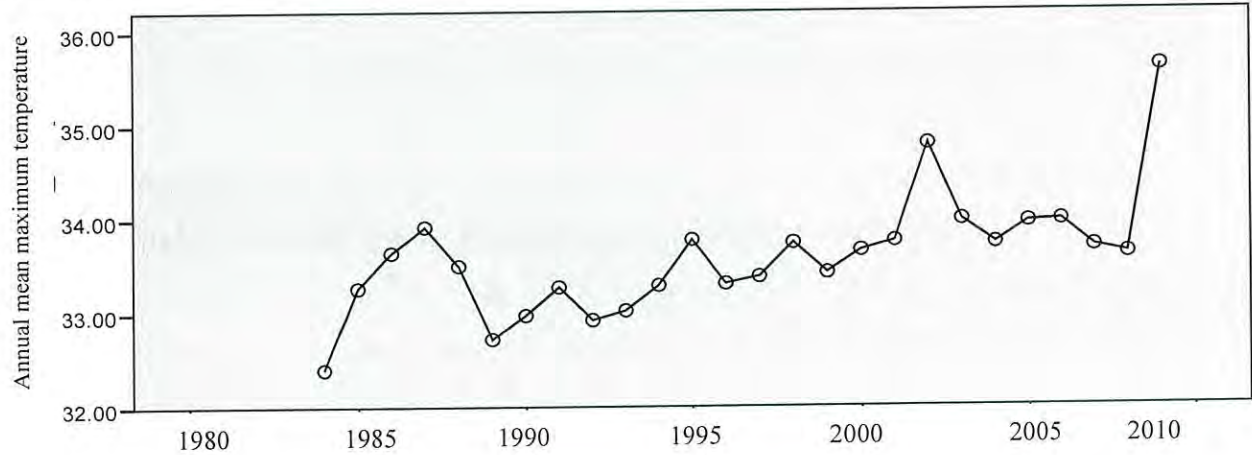
In addition, both FGDs and KIIs participants confirmed that the speed of wind in the present day is highly increased, it flow over long distances, carry much amount of dust and other particle, continuously booming the dust above the ground; both people and livestock could not able to withstand it. Through household survey (Table 7. % of household responses), 96 % of respondents from Yaya and 94 % of respondents from Dire Redie Villages confirmed that as severity of drought was moderate in their village in the past. And 94 % of respondents from Yaya and 92 % of respondents from Dire Redie village confirmed that as the severity of drought is high in their village in the present day. Regarding the speed of the wind 84 % of respondents from Yaya and 76 % of respondents from Dire Redie Village confirmed that as the wind speed in their area was low in the past. But 92 % of respondents from Yaya and 88 % of respondents from Dire Redie villages confirmed that as the wind speed in their villages is high in the present day. Wind speed and severity of drought is more in Yaya village than Dire Redie both in the past and in the present period.

As it can be seen from Figure 6 and 7 which is data obtained from NMSA (2010), confirmed the same idea revealed by pastoralists' households. An average annual temperature of the study area in 2009 is 27.01°C. In the last 10 years, temperatures of the study area have shown an increasing trend. For example, there is a difference between the average temperatures of 1994 - 2001 which

is 25.71 °C and the average temperatures of 2002 – 2009 which is 26.13°C. There is also great intra and inter-annual variation in temperatures of the area. For example, in the last five years from 2005 – 2009 the lowest average annual temperatures is 25.3°C which is in 2008 and the highest average annual temperatures is 27.0°C which is in 2009. In the last decades, maximum temperature of the area is increased by 0.4°C. This clearly shows as the temperatures of the area are in an increasing trend from time to time. According to Aklilu and Alebachew (2009), small increases in temperature can result in measurable impacts on the health of human beings and livestock as well as the availability of water, food, and feed resource. So, one can easily judge the impact of increase in temperature on the livelihood as well as on the health of human beings of the study area.

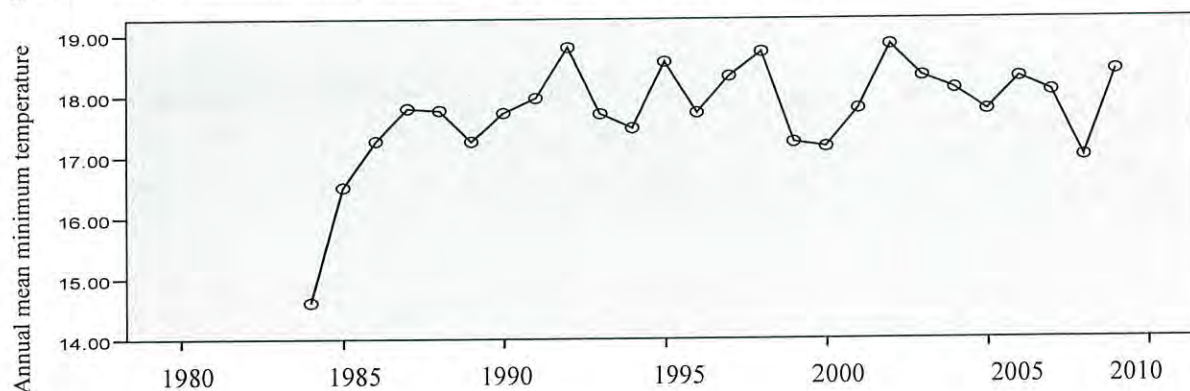
Increase in temperature resulted in loss of meager moisture obtained through scarce rainfall by evaporation and caused scarcity of water required for the production and normal growth of plants, livestock and human being. According to NMSA (2008), the mean annual potential evapo-transpiration of Metehara, is about 2560 mm. However, the average annual rainfall of the area, in the present day is only 451.3 mm. There is a moisture deficit of 2108.7 mm in the area. This indicates as there is huge gap between the annual amount of precipitation received through rainfall and the amount lost through evaporation. With no doubt this has posed serious adverse impacts on the pastoralists’ livelihood base and on the responses that are undertaken by pastoralists of the study area to drought.

Figure 6. Annual maximum temperatures in the study area (1984 – 2009)



Source: NMSA, 2010

Figure 7. Annual minimum temperatures in the study area (1984 – 2009)



Source: NMSA, 2010

4.2.3 Rainfall Characteristics of the Study Area

According to Akililu and Alebachew (2009) the average annual rainfall in the past four or five decades showed a declining trend in the moisture stressed areas of the southern low lands of the country. High rainfall within a short day and intense down pours caused that water runs off in floods (Anderson et al., 2008). The dry area is also characterized by substantial and unpredictable differences in total rainfall between years, with in the year and even between areas in one year.

The climate of the study area is characterized by scarce absolute rainfall which falls unreliably and with in short rainy seasons, and which is often of limited availability for human and livestock use which means low, unpredictable, scattered, variable and erratic. Informations gathered through focus group discussion and key informant interview confirmed that in the present day, intensity of rainfall (that is undertaken with in a very short day) is increasing and in contrast to this length of rainy month is decreasing and even in some years drought is becoming extended for more than 9 months. For example, data obtained from woreda food security office revealed that in the 2002/3, 2005/6 and 2007/8 sever and extreme drought, the area did not receive any rain fall for successive 10 months. The data also revealed as the late initiation and early cessation of rain fall of the area is in an increasing trend from time to time. And the FGD, participants have also compared the present day length of the rainy season with the past; they said that in the past Karrayu had rain in Gannaa,⁵ Furmata⁶ and Arfasa⁷ seasons that was sufficient for germination, growing and regeneration of grasses and browse at each of the subsequent seasons.

⁵ The long rainy season in the area
The shortest rainy season useful for regeneration of browse

⁶ The shortest rainy season useful for regeneration of browse
Rain fall season between march and may

They also explained about the past pattern of karrayu settlements. FGD, participants explained that in the past Karrayu had 3 type of settlements⁸ that were set apart in spatial and temporal basis in which the availability of rainfall, water and fodder; and the suitability of the area for human and livestock health were the main criteria and driving force for the movement of karrayu pastoralists between these settlements with in the karrayu boundary; but this all are not functional today due to the lack of rains. In the present day drought uniformly hit all the settlements simultaneously with out any spatial variation un like in the past. The name of the settlement was derived from the respective rain fall seasons in the areas which were called ona Gannaa, Ona Birra and Ona Arfasa.

Results obtained from the household survey also confirmed as there is variation in intensity of rain fall and length of rainy months between the past and present time. As it is seen from the Table 8, 70 % of households from Dire Redie and 83 % of households from Yaya villages responded that an intensity of rain fall in the present day is high when compared with the pre - 2002. And also 96 % of households from Yaya and 85 % of households from Dire Redie villages confirmed that in the present day the length of rainy month is shortened than the past. In this case, Yaya village is suffered more in shortage of rain fall for several months in a year than Dire Redie village.

Table 8. Huseholds’ responses on the intensity and length of rainfall month in the study Area (%)

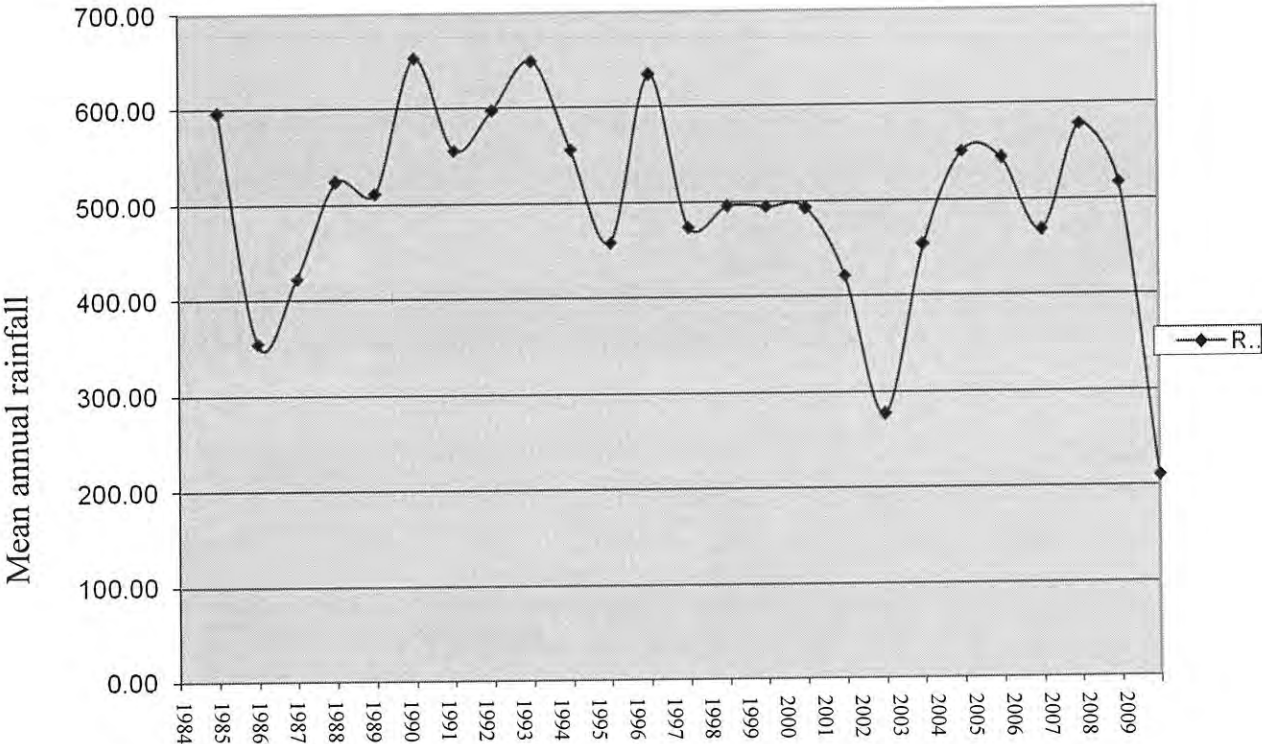
	Yaya		Diree Redie		Average	
	Past	Present	Past	Present	Past	Present
Intensity of rainfall						
- low	65		71		68	
- moderate	35	17	29	30	32	23.5
- high		83		70		76.5
Length of rainy month						
- short		98		94		96
- medium	70	2	65	6	67.5	4
- long	30		35		32.5	

Source: Household Survey, 2010

⁷ Rain fall season between march and may
⁸ The Karrayus’ past day, settlement pattern that was entitled by the name of the rain fall season such as summer, autumn and Spring

As it can be seen from the Figure 8, amount of rain fall in the study area has decreased in an alarming rate from year to year. There is a great variation in amount of annual rain fall in the present day and amount of annual rain fall before 10 years in the study area. For example, the average amount of rainfall between 1990 – 1999 was 556.9 mm and the average amount of rain fall between 2000 –2009 was 451.3 mm. Magrath (2008), stated that the rain oscillation is becoming bigger, rain fall distribution is becoming poor and planning on seasonal rain is becoming harder and harder in the dry land areas.

Figure 8: Annual rainfall of the study area (1984 – 2009)



Source: NMSA, 2010

The data obtained from NMSA (2010), revealed that the decreasing in length of the rainy season and the increasing in intensity of rainfall in the study area. For example, during the severe drought of 2008 the area received 292 mm (57%) of its annual rain fall (516.8 mm) in July and August. But the others seven months of the year 2008, received only 28.1 mm (5%) from the total annual rain fall of the year. This is clearly coincided with what the intergovernmental panel on climate change says in it's forth assessment report in terms of climate change projections in the dry land regions of Africa. Several studies by different scholars (Jennings, 2007; kirkbride and Grahn, 2008; Anderson et al., 2008; Mortimore et al., 2008; Aklilu and Alebachew, 2009) also

stated the occurring of successive poor rains, increases in drought related shocks and less predictable and more intense rainfall events over the medium term on the East and Horn of Africa. This phenomenon is the reality that is seriously challenging Fantale pastoralists in the present day through its adverse effects on the livelihood source; prolonged drought resulting in loss of pasture, drying up of borehole and cisterns and increased in intensity of rainfall with in a short time caused soil erosion and degradation of rangelands in the study area.

4.3 Effects of Droughts on Livelihoods of Fantale Pastoralists'

Since much of the pastoral household's consumption requirement is derived from livestock or exchange with livestock products, the loss of livestock by the drought is a serious risk for the livelihoods and socio-cultural fabrics of the pastoral communities (Aklilu and Alebachew, 2009). Livestock reproduction rate, production and productivity is becoming less and less as the study area is experiencing more extreme events which are becoming more and more intense, notably drought. Household herd size is extremely declined from time to time by the drought and the related effects. The drought caused lack of pasture and water, emaciated livestock body condition, make livestock susceptible to disease, caused livestock death, declined production, productivity and reproduction rate of livestock, and declined pastoralists' terms of trade. In addition, the increase in severity and frequency of drought affected the pasture seed bank, declined and exhausted from time to time the germination, growing, sprouting and regeneration capacity of nutritious grasses, bushes and herbaceous pasture -decreasing seriously rangeland productivity in an alarming rate. These cumulative adverse effects of drought on the pastoralists' livelihood source have caused food insecurity in the study area.

4.3.1 Effects of Droughts on Availability of Pasture

In grazing systems with very high climatic variability, forage availability varies to a great degree with rainfall that herbivore population dynamics are driven by rainfall via its direct effect on forage availability in any given year. In the arid areas, vegetation cover, composition and productivity were strongly determined by rainfall; the decrease in rain fall in different years affects grass production and composition (Dye and Spear, 1982). Rainfall is such an important driving variable in rangeland systems, and its variability is so high. Due to short duration of the growing season, high frequency of severe drought of the present day that is aggravated by climate change, the great inter and intra annual variation in rain fall, encroachment of rangelands by the

other land uses, increasing of human population pressure, expansion of unpalatable tree species, depletion of drought tolerant forage composition by both natural and manmade factors, termite problem, weakening of traditional institution, conflict with the neighbor ethnic group; caused scarcity of forage from time to time in an alarming rate and has posed serious challenges on karrayu pastoralists'. For example, according to data obtained from district land use and environmental protection office, from the estimated 11,397. 43 hectare of total range lands of the district, in the present day 9, 239.75 hectares - partial are degraded and barren and partial are invaded by unpalatable tree species of various *Acacia* species and *P.juliflora*. The relatively slow natural rate of livestock reproduction due to drought and disease also created suitable environment for the colonization/invasion of rangelands by unpalatable tree species.

According to FAO (2008), in recent years the ASALs of Ethiopia have experienced severe and frequent livestock feed crisis of unprecedented proportion. During the FGD, a popular karrayu elder Haji Kasaro said that in the past God provides rain and in turn rains provided pasture for livestock. As it is known livestock is Karrayus' livelihood base; in the past, Karrayu pastoralists' get their entire basic daily consumption from livestock. Rain (water), pasture, livestock and karayus' life is interconnected; there is no meaning out of this connection but in the present day drought disconnects this relation, no rain, no pasture. The severity of drought has posed serious pasture scarcity. They have said that, in the past, when a day or twice shower of rain fall dropped grass was immediately germinating, sprouting and growing and also other palatable tree was regenerating within in a few days.

Figure 9: Scarcity of pasture in the rangelands



Source: Field observation, 2010

But in the present day even if there is a rain it takes long time for germination and growing of grass species and regeneration of palatable browse. This indicates, distortion in the patterns of drought (increase in frequency and severity of the drought) has declined and exhausted germination, growing and sprouting capacity of grasses and also the regeneration ability of browse. In addition to this, late onset and early cessation of rainfall at the critical stage of grass growing period decreased the reproduction process and seed formation of the pasture and affected germination and availability of grasses for the following season. The cumulative occurrences of this process and events for the subsequent season have resulted in the depletion of grasses biodiversity from the karrayu rangelands. They also said that in the past, post drought recovery of pasture was in a short period of time, but in the present day recovery of pasture is prolonged. In addition to this, in the present day, before pasture is recovered from the previous hit, other wave of drought occurred - this situation have gradually resulted in extinction of pasture from the rangelands.

The group also said that in the past there were a number of grass varieties that were germinated by few shower of rain fall and used by livestock and also there were a number of tree species that were regenerated and gave edible fruit for both human and livestock. But in the present day these all are completely destroyed from the karrayus' rangelands due to the drought that is aggravated by climate change.⁹List of some grasses and tree species (edible and palatable for human and livestock, respectively) that is lost from the area is presented hereunder on the Table 9 below. An expert from the district pastoral development office (who stayed more than 20 years in the woreda) also confirmed the idea that was raised by FGD participants, in the past there were a number of grass and tree varieties that were germinated and regenerated by a few shower of rain fall and consumed by both people and livestock within a short period of time. However, these grasses and trees were depleted in the present day from the rangelands due to drought that is aggravated by climate change.

⁹ Due to lack of any study that was conducted on the pasture variety of the area, getting botanical name of the extinct pasture is too difficulty. Hence, in this study the name of the pasture was listed in specific local name.

Table 9. Some grass and tree species that is lost from the range lands by drought

Local name of pasture	Used for
Sapheesa, Ajo, dhadacha, ekie, hudha,	Camel and goats
Citaa, Daremo, mudhugare, dogomdi	Cattle, sheep and human
Tuka, haphe, kichu,	Livestock and human
Kurkura, adie, jajaba,	Human

Source: FGDs Participant, 2010

Participants explained their fear that the recent severe drought do not only caused the present day scarcity of pasture but it also put under question the sustainability of pasture for the future uses through its adverse effects on the forage seed bank.

4.3.2 Effects of Droughts on Availability of Water

Water is the most fundamental physical capital that has shaped pastoral society (Cossins and upton 1987; Helland 1997). In the study area rainfall is inadequate and erratic in terms of amount, duration and distribution to meet the physiological requirements of both plants and livestock. This phenomenon is also further aggravated by high temperature, strong and dry winds leading to high evapo-transpiration which in turn resulted in the scarcity of water. Except during the rainy seasons, water is a critical problem during the dry periods for Karrayu, pastoralists' because the route to Permanent River is encroached by large commercial farms and conservation parks. Hence, the major water sources for both human and livestock in the study area are shallow wells, boreholes, cisterns and ponds for their water requirements which are highly susceptible to drought, even during the normal drought. These water points are completely dried. The scarcity of water is also aggravated by increasing in severity of drought from time to time. Pastoralists in the study area are highly challenged by both poor availability and the accessibility of water points for both human and livestock.

Through household survey 60 % of households from both villages confirmed that as the availability of water from the boreholes, cisterns and wells were moderate in the past. 71 % of the household respondents from Yaya and 67 % from Dire Redie village confirmed that as the scarcity of water availability in their village in the present day is high. Pastoralists' in the study area have trekked their livestock to distance places such as Sheshamne, Modjo, Adama and Boset during drought. For example, according to the participants, karrayu pastoralists have paid 0.30 birr per cattle per day for watering from boreholes of Boset woreda that is owned by private or by community. This has also impact on the pastoralists of the study area. The scarcities of water in

the study area have posed a great burden on women and children. Since the water is dried up during the dry period Karrayu women and children were subjected to deliver water for both human, small ruminants and weak large stock from long distances. Through household survey, all of the respondents from Yaya and Dire Redie village confirmed that as they were travelling more than 7 km (to go water points and to return to house 14 km) and 5 km (5 x2 =10) a day for delivering of water for human consumption, small ruminants and weak livestock, respectively. In this case pure pastoral village has suffered more than agro-pastoralists. And pastoralists in both villages have traveled for Watering of large stock more than 3-5 days during both normal and severe drought period.

4.3.3 Effects of Droughts on Herd Size: Herd Dynamics of the Study Area

An assessment of livestock dynamics of pastoral households of southern lowlands have shown a declining trend or down ward spiral and erosion of livestock asset (Solomon, 1999; Aklilu and Alebachew, 2009). Both studies showed that the declining trend in livestock holding of pastoral households of the southern low lands. Similarly, the livestock population of the study area is declined from time to time due to a drought (death by drought). Especially, the number of cattle is decreasing in an alarming rate due to the lack of intrinsic capacity to escape and endure severe drought. Karrayu pastoralists' angrily explained; and once again claimed 2002 and subsequent adverse effects of drought on their herd size that has been resulting in diminution of their livelihood base. When compared with the last 20 years, the current household livestock holding of the karrayu pastoralists' has declining mainly due to increase in severity and frequency of recent severe drought that is aggravated by the climate change, rapid human population growth, declining in rangeland resources.

Both FGD and KII, participants said that in the past, the severity of drought was low and moderate and it was not resulted in total livestock loss. But 2002 and subsequent drought caused the loss of total livestock and it badly reducing karrayu pastoralists' herd size or livestock holding. They also said that the present day drought is not only caused the loss (death) of livestock but also declined the reproduction (calving rate) of livestock and prolonged recovery period from loss of livestock by the last drought.

They said that when the God was good (to explain the severity of drought or climate change) the karrayus' cows gave calves in an interval of 1 and half years and heifers started provision of

calves in 3 years but now heifers could not give calves even in four or five years and cows could not give calves in an interval of 3 years. Furthermore, during the drought period Karrayu pastoralists deliberately killed immature calves to increase chance of perpetuating and surviving of the reproductive cows from death due to lack of pasture and water. Data from the Woreda pastoral development office showed as there is continuous declining in livestock reproduction rate due to 2002 and subsequent drought. According to the UNDP field report (2002), karrayu pastoralists' had lost 45 % of their livestock due to 2002 severe drought. Table 10 shows livestock that were died during the 2002 and 2008 drought from targeted household of the Yaya and Dirre Reddie village. The data do not include the others year's mild death of livestock by drought and the number of livestock sold in very low price due to the fear of the death by drought.

Table 10. Death of livestock by drought in Yaya and Dirre Redie village (2001/2 and 2007/8 drought)

Village		No of Cattle died during 2002 and 2008	No of Sheep died during 2002 and 2008	No of goat died during 2002 and 2008	No of Camel died during 2002 and 2008	Total
Yaya	Sum	684	746	836	218	2484
	Mean	14.87	16.22	18.17	4.74	
	Std. Deviation	11.295	14.12	16.909	5.972	
Dire Redei	Sum	1426	1208	704	112	3450
	Mean	16.2	13.73	8.19	1.27	
	Std. Deviation	15.205	14.285	8.892	2.495	
Total	Sum	2110	1954	1540	330	5934
	Mean	15.75	14.58	11.67	2.46	
	Std. Deviation	13.957	14.225	13.128	4.344	

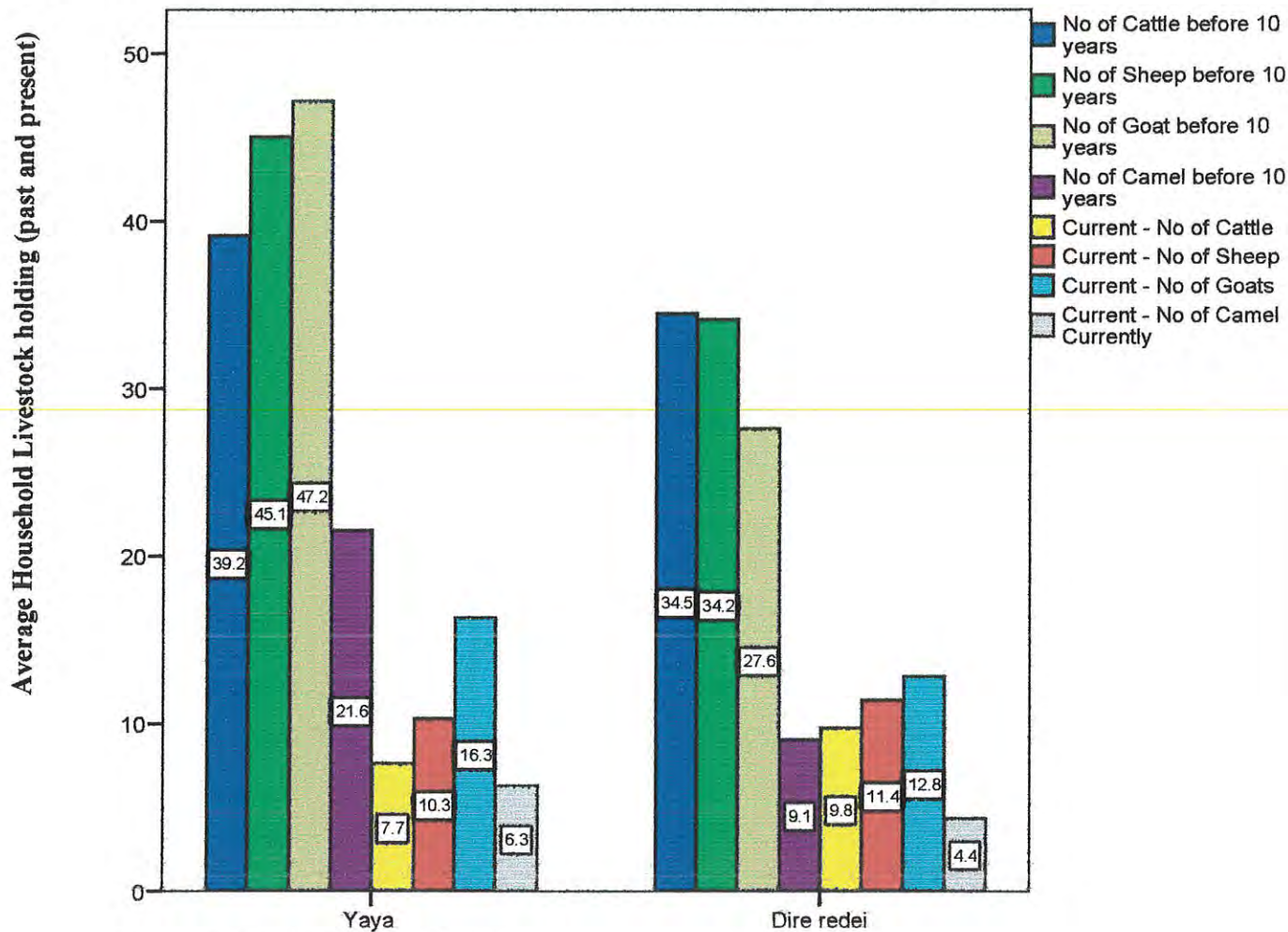
Source: Household survey, 2010

As it is seen from the Table 10, a total of 2,110 cattle, 1954 sheep, 1540 goats, and 330 camels were died by the 2001/2 and 2007/8 severe drought from the targeted households of both village. Each household of both villages had lost 2-30 cattle, 1-29 sheep, 0-27 goats, 0-7 camels during 2001/2 and 2007/8 drought. Average death of cattle was high in the agro- pastoral village than pastoral village. This was due to the fact that pastoral village is more mobile and can escape the adverse effects of drought than the agro-pastoral village. The average death of goat and camel was high in pure pastoral village than the agro-pastoral village. This was due to the adverse

effects of unknown camel disease and madness of goats that was aggravated by drought and has resulted in deaths of camels and goats which is more in pure pastoral village. Average death of sheep was low in agro-pastoral village than pastoral village.

As it is seen from the Figure 10, which showing the past (before 10years) and the present (in the present period) livestock holding of the households of the study site; the average livestock size of the household of Dire Redie village has declined from 34.5 cattle, 34.2 sheep, 27.6 goats and 9.1 camel to 9.8 cattle, 9.8 sheep, 11.4 goats and 4.4 camels. And the average household livestock size of Yaya village has declined from 39.3 cattle, 45.1 sheep, 47.2 goats, and 21.6 camels to 7.7 cattle, 10.3 sheep, 16.3 goats and 6.3 camels. As it can be seen from Figure10, the decline in size of cattle was low in agro - pastoralists (Dire Redie village) when compared with the pure pastoralists (Yaya village) due to the double sword effects of drought on pure pastoralists of Yaya village. Pure pastoral village was lost their livestock by drought and by selling for exchange with cereals. Since Dire Redie Village has supplemented their livelihoods from the opportunistic farming than the Yaya village they (pure pastoral village) were less affected by the double swords of the droughts. And also according to the data obtained from the district pastoral development office, in the present day per capita livestock holding is below 6.5, and from this the proportion of shoat is more than 50 %. This indicates that as the livestock holding of the karrayu pastoralists' are almost becoming below threshold level. According to Scoons (1995) to be able to continue in pastoral mode of life, livestock per capita of pastoralists' should more or equal to 7. The livestock per capita of the study area pastoralists' have showing a declining trend when compared with the past (low livestock ratio to human population). Drought putting household livestock holding below threshold level, as a result, in the present day, pastoral mode of live of Karrayu pastoralists are in a flux (see the detail in the section 4.4).

Figure 10. Past and present herd size of Yaya and Dire Redie Villages households'



Source: Household survey, 2010

Data obtained through household survey which indicates adverse effects of drought, on the household herd size also showed that the declining trend of the household herd size and the increasing trends of the adverse effects of the drought that is aggravated by climate change. As it seen from the Table 11 (% of household responses), 97% respondents from both villages confirmed that both in the past and in the present day drought is causing livestock death, reduce herd size and decline reproduction rate. 99 % respondents also confirmed that in the present day severity of drought effects on the livestock is high. And 83 % of the respondents confirmed that in the present day it takes long period of time to recover from the effects and 11 % of the respondents from both villages confirmed that in the present day there is no recovery from the effects when compared with the pre 2002 drought.

Table 11. Percentage of household responses on the adverse effects of drought on the household herd size

Effects of drought	Yaya		Dirree Reeddee		Total	
	Past	Present	Past	Present	Past	Present
Increased livestock death? Declined herd size? Reduced reproduction rate?						
- Yes	95	99	99	95	97	97
- No	5	1	1	5	3	1
Severity of the effects						
- low	3		10		6.5	
- moderate	77	1	73	15	75	8
- high	20	99	17	85	18.5	92
Recovery period from the effects						
- short	4		7		5.5	
- medium	69	4	83	8	76	6
- long	27	83	10	83	18.5	83
-no recovery at all		13		9		11

Source: Household survey, 2010

Even though, Karrayu pastoralists reared all livestock equally, in the past, they gave more emphases to cattle. In the past wealth and social status of individuals in the society is described by the number of cattle an individual had hold. However, in the present day, the proportion of cattle in the total livestock per individual is decreasing due to drought that is aggravated by climate change. According to key informants, the number of cow that are providing calves are decreasing per households and in the present day the number of cow (reproductive cattle) per each individual of Karrayu community is not exceeds 3-4. In the present day, wealth is determined by the size of the camel an individual has hold and followed by the size of the cattle, goats and sheep. According to FGd, participants in the present day karrayyu pastoralists have given more emphases on the camel and goats due to their ability to escape and tolerate drought (see the detail in the section 4.4)

As it can be seen from table 12, there is a great significant difference between the past and the present average household livestock holding (all livestock category) at 0.05 levels. Present day livestock holding of the household is seriously declined when compared with the past in all livestock category. This indicates that as a recent severe drought and its related adverse effects have declined the intrinsic drought escaping and tolerance capacity of goats and camels.

Table 12. Paired T – test made to compare the level of average household livestock holding before 10 years and in the present day

Item	T	Df	Sig. (2-tailed)
	mean	Std, deviation	Sd.Error mean
Number of Cattle before 10 years and Current number of Cattle	14.781	133	.000
Number of Sheep before 10 years and Current number of Sheep	7.130	133	.000
Number of Goat before 10 years and Current number of Goats	11.754	133	.000
Number of Camel before 10 years and Current number of Camel	5.794	133	.000
Total livestock size before 10 years and Current total size of livestock	11.919	133	.000

❖ Significance at 5 %

Source: Household survey, 2010

4.3.4 Effects of Droughts on Livestock Production and Productivity

Extensive Livestock rearing is the main means of livelihood bases for karayyu communities. This implies that production and productivity of livestock would have a significant effect on the livelihood of the community. The livestock are sources of food, income, prestige, and security in times of hardship. In the present day, Karrayu raised Livestock for a mix of subsistence (particularly milk) and market needs (e.g. selling livestock to purchase food and other basic necessities). The livestock in turn depend primarily on the feed resources available on the rangelands. Both FGD and *Kll, participants* revealed that in the past livestock production and productivity is higher than in the present time. They said God¹⁰ was good (climate was normal and raining) pasture was available; as a result cattle gave milk and milk products. They said that in the past Karayus' routine food (daily consumption) was milk, milk products, blood and meat. An elder from Yaya village during the focus group discussion said that **Karrayu has had¹¹ no suuqi** and Karrayus' Suqi is livestock; livestock were source of everything for Karrayu pastoralists. For example drink milk instead of water; eat butter and milk products instead of food. They have said that in the past there was sufficient pasture (locally called citaa). Hence, livestock provides sufficient milk. Traditionally Karrayu produce and consume milk of cow, sheep, goats and camels.

But now, livestock denied karrayu pastoralists,' especially, during a dry period milk is not expected at all and we suffer how to survive the livestock from death. Due to the lack of pasture; the livestock body condition is emaciated, susceptible to disease and also severity of hot and variation in daily temperatures caused break out of external parasite (pest) and has resulted in

¹⁰ God was good – which means climate was normal and there was raining

¹¹ Which means has had no other livelihood sources other than livestock

declining of livestock physical condition-as the result karrayus' livestock have low demand for meat on the market. In addition, they have said that in the past, livestock was recovered in a short period of time from the effects of drought and provided milk, but in the present day recovering takes a long period of time due to the increasing in frequency and severity of drought. Data from the woreda pastoral development office also revealed that as there is more than 50 % decrease in milk yield after the severe drought of 2002. Data collected from the household also confirmed the view of both group discussions and key informant interview participants.

As it is seen from the Table 13 (% of household responses), all respondents from both villages confirmed that both in the past and in the present day, drought reduce the quantity and quality of milk, and meat from the livestock, cause breakout of both human and livestock disease and pest. However, 99 % of respondents from Yaya and 97 % of respondents from the Dire Redie villages confirmed that severity of the drought effects on the production and productivity of livestock is high in the present day than the past. And 87 % of respondents from Yaya and 83 % respondents from Dire Redie Villages confirmed that recovery period from the effects of drought is long in the present day than in the past. And 11 % of the respondents from both village confirmed that there is no recovery at all from the present day effects of drought. Pastoralists' of the study area claimed that recovering from the effects of the present day drought is unattainable due to the occurrence of the other wave of drought before recovering from the previous hit. There is no big difference in declining of livestock production and productivity and recovery period from the effects of the drought between both villages in the past and in the present day.

As it is seen from the Figure 11, which showing the past (before 10years) and the present (in the present period) average of milk per day per livestock; an average milk production of household of Dire Redie village per day per livestock has declined from 3.33 liter per cow per day, 1.27 liter per sheep per day, 1.53 liter per goats per day and 6.08 liter per camel per day to 1.36 liter per cow, 0.93 liter per sheep, 0.75 liter per goats and 2.62 liter per camel per day, respectively. An average milk production of Yaya village per livestock has declined from 4.22 liter per cow, 1.65 liter per sheep, 1.04 liter per goats, and 6.09 liter per camel per day to 1.28 liter per cow 0.77 liter per sheep, 1.33 liter per goats and 2.59 liter per camel per day respectively. There is a great significant difference in milk yield per day per all livestock category between the past and present

day except milk from goats. This indicates the increase in frequency and severity of drought has posed a declining of milk per livestock per day in the present day.

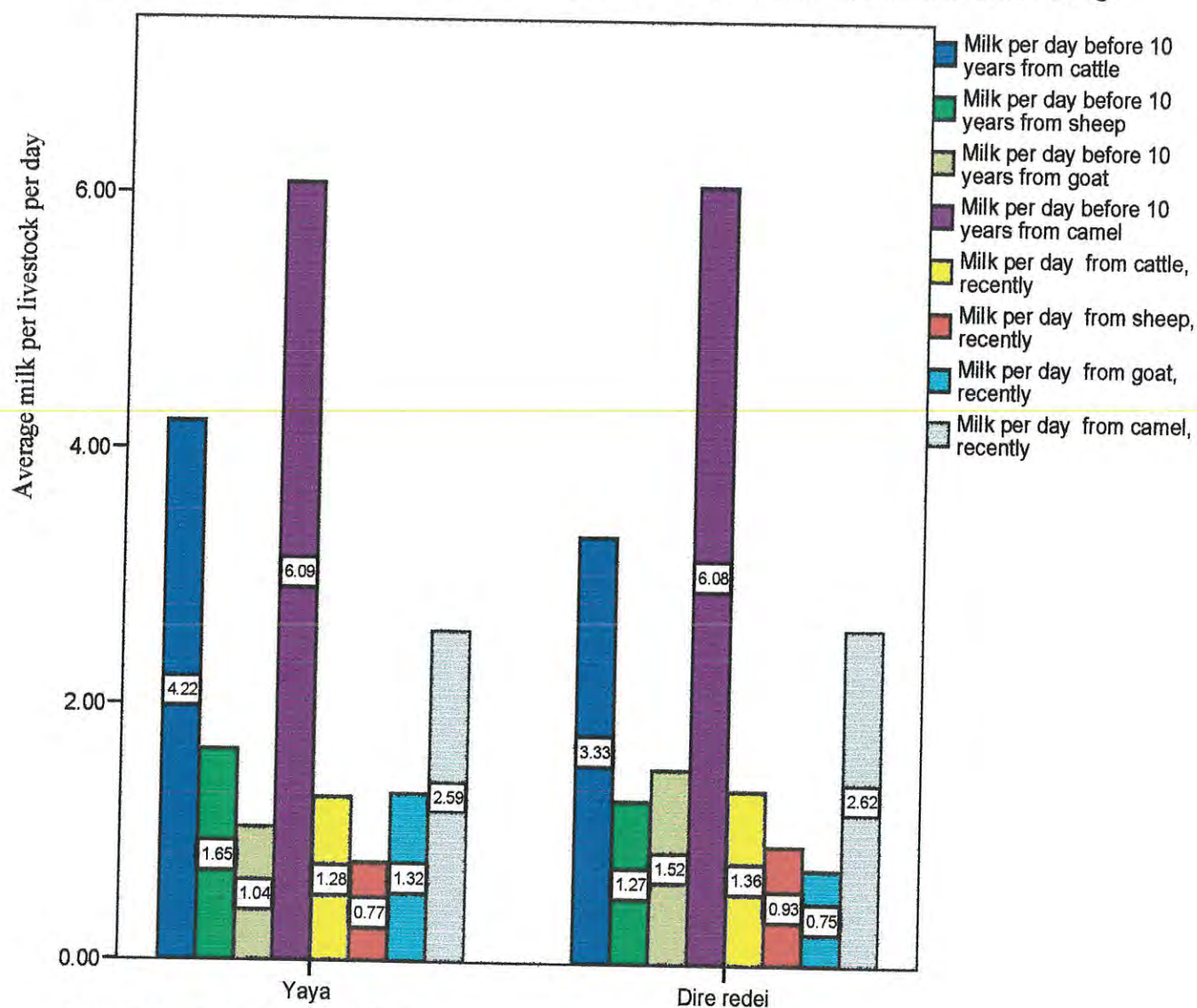
Table 13. Percentage of Severity and Effects of Drought on Livestock Production and Productivity

Adverse effects of drought	Yaya		DR		Total	
	Past	Present	past	present	Past	present
Declined milk and other livestock products?						
Yes	100	100	100	100	100	100
No						
Severity of the effects						
Low						
Moderate	97	1	96	3	96.5	2
High	3	99	4	97	3.5	98
Recovery period from the effects						
Short	93		89		91	
Medium	7	3	11	7	9	
Long		87		83		85
No recovery at all		13		9		11

Source: Household survey, 2010

The decline in milk yield from cattle is high in pastoralists' village when compared with the agro-pastoralists villages. This is due to the increasing of mobility by pure pastoralists in the present day than the past. Since cattle of the pastoralists are moved to distant places than the agro-pastoralists (Dire Redie) the chance of exhaustively using milk from cattle by pastoralist in the present day is very low. In addition agro-pastoralists have minimized the scarcity of pasture by crop residue than pastoralists' village. Declining in camel's milk is almost equal in both villages. This is due to unknown present day camel disease and increasing in mobility of camels to distant places. In the present day milk from goat is not showing variation when compared with the past. This is due to the fact that in the past, households had not exhaustively used milk from goat since milk from cattle was abundant. In addition, small stocks unlike large stocks such as camel cannot move to distant places during the drought, as the result small stocks including goats are more accessible for consumption for majority of the household members in the present day than the other livestock moved to distant places. Hence, this does not indicate the increment in milk yield from the goat in the present day but it indicated the under utilization of milk from goats in the past day due to the availability of milk from the cattle and camel.

Figure 11. Past and present day amount of milk per livestock per day in Yaya and Dire Redie Village



Source: Household Survey, 2010

4.3.5 Effects of Droughts on Pastoralists' Terms of Trade

Toulmin (presented) has presented a three stage model of the drought cycle which indicates the stages of severity of drought within a given time frame. According to his model in stage I, failure of rains (drought) declined availability and quality of forage and resulted in death of large number of livestock with a moderate decrease of prices of livestock and increase in price of grain (a situation of price scissors effect occurs at this stage). In the II stage, drought reaches its climax accompanied by continuous increase of livestock off-take either through death, sale, or slaughter despite the relative improvement of rain fall and water - Grain price continues to escalate. In the stage III, availability of rain fall improves pasture conditions, which means pasture recovers from

the effects of the previous drought and becomes ready to support more livestock and livestock prices started to rise.

According to my view this model is functioning only when the occurrence of drought or cycle of drought is long; and its practicability is completely under question, *especially, in the present day, when the drought cycle is shortened and* do not allow recovery of pasture in a given time frame due to the increasing in the severity and frequency of drought that is aggravated by the recent climate change. In addition, according to my view the higher the frequency of drought years with giving no time to recover from the previous hit, the lower the recovery from the effects of the drought. This is the reality that is observed in the present day in the study area. This also put in the present day, functionality of the model under question. As it is seen from this study the increase in frequency of drought and the increase in extent of the severity of drought effects on the karayu pastoralists' livelihood is greatly prolonged the recovery time. Even in some cases there is no recovery at all due to the occurrence of other wave of drought before recovering from the previous hit

In addition according to Scott-villiers (2006) Pastoralists' receive poor price during the drought, especially if the condition of the animal is poor due to weight loss and stress caused either by drought, a long trek over difficult terrain, or both. During discussions and interviews, the pastoralists and woreda official raised that both in the past and in the present day, droughts caused scarcity of pasture and have been resulting in declining of livestock body condition and this in turn has resulted in fall of karrayu pastoralists' livestock price and the rise of grain price in market. However, in the past, cycle of severe drought was long and karrayu pastoralists' were easily recovered from the effects within a short period of time and terms of trade was improved as pastoralists started to get sufficient milk and other livestock products. However, in the present day every year is drought, cycles of drought is too shortened and it does not give time to recover from the effects and caused continuous fall of livestock price and rise of grain price (negative terms of trade). They also confirmed that during drought, especially, during the severe drought in fear of death of livestock, karrayu pastoralists' are subjected to gather (over supply) their livestock to market but demand is very low due to the livestock body condition is highly declined.

According to cuttler (1985), in Ethiopia the impacts of drought are increasing grain retail prices and sales of livestock. The ability to buy food or not depends on the amount of the livestock assets and their value in purchasing the food required to sustain the livelihood of the pastoralists. However the price of the livestock during drought is such low that pastoralists can no longer buy goods to sustain themselves. Thus, combination of price and number of holdings of livestock provide the extent of pastoralists to purchase goods and services. Similarly, an elder from Dire Reddie village said that the price of livestock is decreasing but in contrast, the price of grain is rising up, specially, during the 2002 and subsequent droughts. This situation is badly challenging karrayu pastoralists' livelihoods. In the past there was social support for those who became handicapped, but in the present day no one is better than each other, the increase in frequency and severity of drought make all equal, increase the number of destitute; and the past social support is not expected and not functioning properly in the present period.

It is a widely accepted view that drought distorts the terms of trade between livestock and cereal prices. When a drought occurs, prices of livestock fall to the point where it becomes hardly possible for pastoralists to purchase cereals. In this case double sword of drought affects pastoralists in two ways. First, they lost dominant sources of their livelihood - livestock through low prices in exchange for cereals. Second, loss of live stock due to death by drought and also loss of the amount of milk needed in their daily diet and food consumption. For Example, according to information obtained from the woreda pastoral development office, during drought period the price of all livestock category is fall by more than 50 %, in contrast to this, the price of cereals rise by more than 40 %. Karrayu pastoralists also claimed that traders knowingly fall the price of livestock during severe drought.

The household survey result revealed (Table 14. % of house hold responses on the negative terms of trade), 97 % of respondents from Yaya and 90 % of respondents from Dire Redie village confirmed that as the negative terms of trade was moderate in the past. But 90 % of respondents from Yaya and 68 % of respondents from Dire Redie villages confirmed that as the severity of negative terms of trade is high in the present day than the past. The severity is high both in the past and present day in pure pastoralists' villages than agro-pastoralists due to the double swords of drought effects which is more on the pastoralists than agro-pastoralists. And 90 % of

respondents from both villages confirmed that required recovery period from the adverse effects of the drought is long in the present day than in the past.

Table 14. Percentage of household responses on adverse effects of drought on pastoralists' Terms of Trade

Adverse effects of droughts	Yaya		Dire Redie		Total	
	Past	Present	Past	Present	Past	Present
Decline price of livestock? Rise grain price?						
Yes	97	99	96	99	96.5	99
No	3	1	4	1	3.5	1
Severity of effects						
Low	3		10		3.5	
Moderate	97	10	90	8	96.5	
High		90		68		91
Recovery period						
Short	97		96		96.5	
Medium						
Long		91		91		91
No recovery at all		9		9		9

Source: household survey, 2010

4.3.6 Effects of Droughts on Pastoralists' Households Food Security

Fentale pastoral woreda is chronically food insecure, characterized by food shortage for more than six months of the year. Recurrent drought and chronic water shortage both for human and livestock, as well as conflict, human and livestock diseases have contributed to food insecurity. In addition, low income level and low per capita asset holding in terms of livestock number have aggravated the food insecurity situation. As a result about 58 % of the households in the district are food insecure and are vulnerable to drought and its related impacts (PCDP, 2007). FGD, participants indicated that in the past milk, meat and blood were sufficient for daily consumption and Karayu pastoralists' seldom used grain for food and there was no food problem. They said that during drought period neighbor farmers and traders from Argoba and Amahara had come and exchange their grains for butter (this was seldom practice, because Karayu culturally undermine selling of milk and milk products). An elder from Dire Redie village (Gelcha Kebele) raised that in the past, children consumed shoat's milk and it was sufficient for them and adult consumed cattle and camel's milk. But in the recent time even if individual has 100 lactating livestock, milk is not available, especially, during drought period even for children.

A key informant, Mr. Baati Boru-who spent more than 25 years in the woreda, a government employee and currently working in the Fentale woreda administration office, confirmed the view

raised by pastoralists' elders. He said that climate changes aggravated magnitude of drought and resulted in scarcity of pasture and declining the herd size. This led pastoralists' households to food self insufficiency and food insecurity. In the past I well know, Karrayu pastoralists' had large number of livestock and produced sufficient amount of milk for their daily consumption. But in the present day livestock holding is highly reduced and even those who hold large stock do not produce milk, especially during the drought year. Hence, in the present day, karrayyu pastoralists' have suffered in starvation or lack of food. Children and elder could not get milk and situation is becoming serious from time to time.

A data obtained from the household survey and woreda DPPO also confirmed the idea explained above. All respondents from both villages responded that drought has caused food insecurity in the present as well as in the past. However, severity of food insecurity in the past was low and it takes short time for recovery, but the severity of food insecurity in the present day is high and requires longer time for asset recovery.

Currently, Fantale woreda is one of the food in-secured woredas of Oromia regional state due to the recurrent drought and the harsh nature of the climatic condition of the area. From 18 rural kebeles, 13 are food insecure and continuously supported through safety net programme under the broad category of public work participation and direct support for the last three years. The main aim of this programme is to build the capacity of the households' (asset building), to reduce destitution and vulnerability; and is one of the component of the early warning and drought cycle management through the programme of food for work in which the beneficiaries are undertaking different kinds of private and public productive activities such as water harvesting, participation in primary school and health post construction and rural road maintenance. The total beneficiaries under public work participation and direct support of safety net programme in the last 3 years were 15, 760, 15,760 and 14,132 in the years 2007, 2008 and 2009, respectively (Table,15). Through household survey, it is identified that 27 % and 20% of respondents from Yaya and Dirree Redie village are confirmed as they are beneficiaries of the safety net program in the last 3 years, respectively.

Table 15: Number of Beneficiaries in Safety Net Programme (PSNP) by Year

Year	Public work			Direct support			Total beneficiaries
	M	F	Total	Male	Female	Total	
2009	7021	6269	13,290	438	404	842	14,132
2008	7,100	7,111	14,211	813	736	1549	15,760
2007	80720	6810	14,882	562	316	878	15,760

Source: Woreda DPPO, 2010

In addition, relief aid is provided periodically through emergency aid programme. This emergency aid programme is under taken to save life and livestock from the effects of prolonged drought. As it can be seen from the Table 16, numbers of beneficiaries are in increasing trend from year to year, 18,383, 7571, 22505, and 22,508 in 2005, 2006, 2008 and 2009, respectively. Data of Numbers of emergency aid beneficiaries in 2007 and 2009 were not available.

Table 16. Numbers of emergency Aid beneficiaries in the woreda

Years	HH			Family			Total emergency aid beneficiaries
	Male	Female	Total	Male	Female	Total	
	4746	408	5154	6212	7017	13,229	18,383
2005	1442	127	1569	3086	2916	6002	7571
2006	5026	500	5626	15078	2000	16,578	22,505
2008	5026	500	5626	15078	1500	16,578	22,505

Source: WDPPC office, 2010

Through assessment undertaken by woreda early warning committee at the end of 2009, the number of people in needy of emergency aid in this year (2009/10) is increased from 22,505 (2009) to 24,184 (35% of total population of the woreda) due to the late initiation and early cessation of Ganna (main rainy season of 2009) and complete failure of Furmata (short rainy season of 2009) rainfall that are resulting in declining of pasture and crop productivity and caused food insecurity on the pastoralists households. From this anyone can easily judge the effects of drought on the pastoralists' food security. Through household survey it is identified that 39 per cent (37% from Yaya and 43% from Dirree Rede villages) were currently beneficiaries of emergency aid programme due to loss of their livestock by drought and related adverse effects.

CHAPTER FIVE

Responses to Drought

In the present day, in the study area, responses to drought are undertaken by both pastoralists (internal response) and in some extent by external actors such as governments and NGOs. Even though some progress is seen regarding government intervention in drought risk reduction through promotion of livelihood diversification, early warning and emergency aid; NGOs participation is still very low both in scope and in number in the study area.

5.5.1 Internal Responses

Internal responses are a set of responses (activities) that are undertaken by pastoralists to mitigate and to minimize the adverse effects (effects on lives and livelihoods) of both usual drought and the present day severe drought that is aggravated by climate change. Internal responses are divided in to two major categories such as pastoral activity responses and non pastoral activity responses. The pastoral activity responses are divided in to sub categories such as mobility, herd diversification, herd splitting, forced selling, social supports and reduction of meal per day. Even though, most of these responses (pastoral activity responses) are traditionally adapted by pastoralists in order to live in the harsh to live environment and to overcome the effects of normal drought of arid and semi-arid low land areas; in the present day pastoralists have modified an extent of their responses mechanisms to withstand the effects of recent severe drought that is aggravated by climate change. For example, according to this study an extent of present day mobility and herd diversification are increased or becoming higher than the past as modified responses to climate change; and selling of livestock, especially, cattle including cow and livestock product is developed as a new response to severe drought that is aggravated due to climate change by Karrayu pastoralists'.

The non pastoral activity responses are also divided in to sub categories such as opportunistic agriculture, collection, burning and selling of fuel wood and charcoal, trade (petty trade), casual labor, and use of wild food. Even though most of these activities were started in a response to sever drought of 1980s by the karayu pastoralists, the extent of this responses is becoming high in

this decades as a response to severe drought that is aggravated by the climate change and resulted in loss of the dominant livelihood asset (livestock).

5.5.1.1 Pastoral Activity Responses

As described above, pastoral activity responses are the traditional responses that have been used by pastoralists to minimize the adverse effects of drought on their livelihoods. In the present day, in the study area more functionally pastoral activity responses are mobility, herd diversification, selling of livestock and livestock products, social support, traditional natural resource management and meal reduction.

Mobility

Mobility allowing pastoralists to respond quickly to fluctuations in resource availability and thereby to maintain their herds and other assets as well as their productivity, enables pastoralists to inhabit areas of harsh and volatile climate and to transform seemingly unproductive wastelands into assets. It allows tracking changes in the dramatic fluctuations in feed supply, avoiding areas where forage is insufficient and mopping up surpluses where they are abundant (Sandford, 1983; Behnke and Scoones, 1993, cited in Behnke, 1994). Pastoralists are specialists, they respond to and use, even choose and profit from variability. Highly variable, unpredictable and often scarce rainfall dictates where, when, and how much vegetation is available for their livestock to graze (Behnke, 1994). The exchange of services and negotiation of land access between pastoralists and farmers have allowed pastoralists to adapt climatic variability.

Although in the past, an extent of mobility outside of their boundary was low, Karrayu pastoralists' had moved more in their boundaries in accordance of spatial and temporal variation of pasture and water availability that were based on the rain fall season such as **ona Ganna**, **ona Birra** and **ona Arfasa** before the in appropriation of the kaarryu dry season grazing land for other land uses by the external bodies. Karrayu have undertaken this mobility to track fresh pastures, avoid overgrazing and evade disease, conflict and drought condition. When the scarcity of pasture and water was observed in the area of ona Gannaa settlement, Karrayu moved their livestock with their whole families to the other potential settlement to the ona Birra and also to the ona Arfasa. The cycle of mobility was continuous and in the past unless during the extreme drought, karrayu seldom moved to the other distant area in search of pasture and water.

According to both FGD and KII, participants, in the present day, the extent of mobility by Karayu pastoralists' in search of water and pasture to a distance area is high. The increase in frequency and severity of drought leave the pasture land barren and drying up water points. These subjected the community to move their camel up to Hosa'ina (SPNN), Shashamane, Modjo and Adama area; and their cattle up to Bosat woreda. Even when this study is undertaken including lactating cows no any livestock is available around the village.

Table 17. Percentage of an extent of mobility in response to drought to distant places

Extent of mobility	Yaya		Dirree Redie		Total	
	Past	Present	Past	Present	Past	Present
No						
Low	2		10		6	
Medium	98	10	90	30	94	20
High		90		70		80

Source: Household survey, 2010

According to woreda pastoral development office views, in the present day an extent of mobility is highly increased and even children and elder have not obtained milk due to the reason that all cows are stayed at a far distance from the woreda more than six month in a years in search of pasture and water. As it seen from the Table 17 (% of household response), 98 % of Yaya and 90 % of Dire Redie villages respondent confirmed that in the past the extent of mobility was moderate. And 90 % of Yaya and 70 % of Dire Redie respondents confirmed that in the present day the extent of mobility is high. Both in past and in the present day extent of mobility is high by pure pastoralists than the agro-pastoralists.

Herd Diversification

Karrayu pastoralists have been raising different species and breeds of livestock to make optimum use of different ecological niches, particularly in the dry season when resources are scarce. Traditionally unlike other Oromo pastoralists, karrayu reared different livestock compositions such as cattle, shoats, camel and some equines and also unlike other Oromo pastoralists, karrayu traditionally consumed milk of cow, camel, sheep and goats. Unconsciously, Karrayu reared large amount of shoats in the past, and even do not discern their numbers and reckoning only shoats which started giving birth and the numbers of others are not clearly known. In the past Karrayu investing much on fertile female cows, to build up herd size as an insurance against drought, disease and raiding; and also reluctant to sell reproductive cows. According to OPADC

(2009), Cattle and sheep are predominantly grazers, feeding on grasses. The capacity of Karrayu breeds rapidly to put on weight after the rains in the past (compensatory growth or recovery in short period of time) is admirable. While camels and goats can survive in harsher environments of Karrayu rangelands by browsing leaves, feeding the pods and fruits of trees which is too scant in the present day (see Figure 10).

Figure 12 . Pastoral households herd diversification



Source : Field observation, 2010

In the present day, Karayu pastoralists' sale small stocks to cover all their basic necessities such as grain, garment, house utensils, health expenditure and for social obligation, however, they highly recovered from the effects of forced selling due to their high birth rate that are undertaken within a short time interval. Hence, karrayu pastoralists' called small stocks **Lubbu¹² Dhaqabo**. For example, shoats give birth in an interval of 5 – 7 month and urgently solve the household cash problem. Not only this but also small stocks provide milk in the drought period more than large stocks without significant variation from the normal years. And also in the present day, karrayu have given more emphasis to camel since camel tolerate draught for long period of time,

¹² means indemnity during critical time and solve households problem

move to far distances and survive from the effects of prolonged drought, produce high amount of milk both during normal time and drought year, use different plant variety as a feed sources, and also used as a pack animal in the rural areas. However, it requires high initial capital and hold mostly by the medium and richer wealth group of the community.

According to FGD, participants in the past when drought was normal karrayu had specified herd structures to maintain an ideal portfolio of livestock and to meet their long and short term objectives in which adult cows were needed to produce milk in the short term and give births to calves that later will grow in to adults. Thus ensuring the future survival of the family, adult steers are needed for sale or major ceremonial purposes, a bull is needed to inseminate cows, heifers are needed to replace cows while young steers to be fattened for future sale. Sufficient supply of small stock (sheep and goats) was also essential to the families more routine needs without resorting the sale of the cattle and camel herd, which represent the main resource of the family while donkeys and camel are critical for providing transport. Even though, in the past, karrayu pastoralists' reared all livestock equally; in the present day an extent of rearing different types of livestock by Karrayu pastoralists' in response to drought risk reduction is becoming high. Currently, Karrayu inclined more towards small stocks and camel as a modified response mechanisms to minimize the adverse effects of recent severe drought (climate change) and to diversify livelihood source bases. Especially, browsers are unlike grazers feed the different variety of natural pasture and bushes found in the rangelands and less affected by drought when compared by grazers. For example, according to Fantale pastoral development office, from the present total livestock number of 545,909 of the woreda share of small stocks is high which is more than 51 % (sheep is 131,829 and goats are 147,535) and the share of camel is 15 % (camel is also 81,204).

Table 18. Percentage of households' Extent of Herd Diversification in Response to Drought

Extent of herd diversification	Yaya		Dirre Redie		Total	
	Past	Present	Past	Present	Past	Present
No	2				1	
Low	10	3	20	6	15	4.5
Medium	78	7	65	20	71.5	13.5
High	10	90	15	74	12.5	82

Source; Household survey, 2010

In the present day, Karrayu pastoralists' have given more emphasis to camel, shoats and cattle in decreasing order depending on their drought escaping and drought tolerant capacity; unlike in the

past in which wealth was determined by the number of cattle. Through household survey (Table, 18), 77% of the respondents confirmed that their extent of herd diversification is becoming high for the purpose of minimizing drought risks in the present than in the past. An extent of herd diversification is high among pastoralists than agro-pastoralists in the present day. However, extent of herd diversification of both villages is high in the present day than in the past day.

Box 2: Case Study

Milkoo Sabbaa Boruu Jilo was one of the pastoralists of Dhaka Heddu PA. He is a 63 years old. He is with his wife and 2 young children those not married and they have not attended school. He said that prior to the Abari of 2002 had 40 cattle (25 cows, 6 bull and 9 heifers), 13 camels and several shoats and also milk was abundant and entirely depends on livestock and livestock products. But now I have only 13 cattle (4 cows, 2 bulls and 7heifers), 2 camels and 30 shoats. Drought affected my livelihoods; partial are lost by drought and partial are sold for exchange with cereals. No milk from the livestock as before. We hardly get some dive of milk for children when a shower of rain fall is spontaneously fall. I am old and I have health problem which deter me from undertaking activities other than pastoralism. However, in the present day I have started to diversify my stock and I have made special emphasis to small stocks and also to camels.

Selling of Livestock and Livestock Products

Pastoralists sell their livestock rarely. Since livestock number is socially valued they rather prefer to keep as much livestock as possible (Aklilu and Alebachew, 2009). Woreda livestock Experts explained that in the past, karrayyu pastoralists were traditionally reluctant in selling of cattle and livestock products. In the past, Karrayu usual sold weak cattle and rarely sold reproductive livestock, especially, except during special social ceremony like marriage. karrayu sold small stocks (shoats) to cover basic household expense such as salt, spice, fuel, garment, etc. In the past day, livestock and livestock products were sufficient for the household consumption and also an extent of livestock selling as response mechanisms to minimize adverse effects of drought was low. But in the present day average livestock holding per capita is becoming below threshold level due to loss that is caused by recurrent drought. Lack of water and pasture that is caused by rangeland degradation, conversion of dry season pasture lands to other land uses, invasion of pasture lands by unpalatable exotic and indigenous shrubs and bushes, eradication and depletion of palatable herbaceous, grasses and bushes by severe drought (degradation of pasture biodiversity and genetic deterioration due to both natural and manmade factors which requires independent study in the future) resulted in declining of household herd size.

This in turn has resulted in reduction of production and productivity from livestock, forcing pastoralists' households to undertake forced selling for the purpose of purchasing grain. Especially, since 1984 devastating and debilitating drought, karrayu have started unusually selling of livestock including cows and livestock products as a modified response mechanisms to minimize loss/death/ of livestock by drought and also for exchange of grain. For example, according to information obtained from informants, in the present day, monthly, in average Karayu households' sale 1-5 small stocks; and yearly 3-6 cattle and 1 camel in a normal year for exchange of grain, other basic household necessities and for social and economic obligation. In the past, Karrayu was also reluctant to sell livestock products such as milk and butter, but in the present day they have selling the meager available milk and milk products as a newly developed response mechanisms to drought and as a means of diversifying a source of income.

Household survey result also revealed that 77% (80 % from Yaya and 74 % from Dirre Redie village) responded that in the past day extent of selling of both livestock and livestock products were low. And 85 % (90 % from Yaya and 80 % from Dirre Redie villages) confirmed that as an extent of their selling of livestock and livestock products as response mechanisms to drought which is aggravated by climate change is becoming high in the present day than in the past. In the past extent of selling livestock and livestock product were low in pastoral village than agro-pastoral village but in the present day it is high in pastoral village than the agro-pastoral village.

Social support

According to informants, traditional Karrayu Oromo system encourages and supports sharing of resources and mutual assistance mechanisms that serve as risk spreading tools among households, and communities. Pastoralists who are victims of calamities have the right to seek support in kind and in cash. In the past there was no destitute in the community; when somebody lost livestock due to natural or manmade factors, the relatives donate lactating cows for the handicapped for a defined period of time. This was undertaken not only for the purpose of overcoming short term problem but also in expectation of rebuilding the asset for the future; at the end, the owners left the calf and return back the cows. In a range of 1-2 years a person become fully recovered his herd. In addition in Karrayu tradition there is a type of loaning animals "surplus" to subsistence requirements to family and friends to help them rebuild their herds and develop social relations as a form of social capital as hedge against drought and other

risks which allows Karrayu families to maintain a functional balance between herd and family size. Furthermore, in a karrayu culture partiality was not known and every one share from each other and some body's (neighbor) resource was considered as each other's resources. Because of this extended and bonded traditional background karrayu was strongly believe each other and split their herds among different relatives to overcome the scarcity of pasture and water in certain locality and also to reduce over grazing. But consultation and agreement of household members are undertaken prior to make gifts, transfers, and loans of any type of livestock including small ruminants.

However, in the present day the extent of social support is gradually declined due to the depletion of asset by recurrent drought and is resulted in increasing of destitute pastoralists. FGD, participants reflected that in the past karrayu supported each other, holding asset is only for the sake of social value and those who had no livestock were equally used without any partiality from their neighbors. But this situation is not expected to day, almost all are equal, the numbers of destitute are increasing from time to time due to the increasing in the occurrence of severe drought. Through household survey, all respondents from both villages also confirmed that the extent of social support is low in the present day when compared with the past.

Natural Resource Management

Pastoralists employ a number of highly specialized risk spreading strategies to safe guard their herds in the face of unpredictable and some time extreme climatic events, disease out breaks, and social unrest. These strategies are the rational use of the natural resource base on which the herds depend and also build strong social net works (Hesse and MacGregore, 2006). Grazing management can contribute to biodiversity and promote biomass production. Dry land ecosystem health is better were mobile pastoralism continues to be practiced effectively (Mcnaughton, 1993 and Niamir Fuller, 1999, cited in Redriguez, 2008).

To many it appears that the dry lands belongs to no one in particular, and that communal land means free – for all grazing where pastoralists try to outdo each other in terms of herd size to ensure that individual persons or groups benefit the most from this assumed 'open access' resource. Such open access is expected to eventually lead to exhausted and degraded pasture (Tragedy of the commons' thinking (Behnke, 1994), But dry lands under communal land tenure are not 'open accesses'. They are divided up between groups, and rights to the use of these areas

are defined and redefined through negotiations, communications and other means. Strict rules are put in place to maintain these rights (Behnke 1994; little, 2001). In this way pastoralists ensure that pastures can sustain them and allowed them to replenish. Traditionally, Karrayu pastoralists' manage their pasture lands through different techniques. For example, mobility, identified dry and wet season grazing location, burned the rangeland to facilitate the regeneration of grasses at the onset of rain fall. Karrayu pastoralists also burned the rangelands for controlling the effects of pests such as ticks and for facilitating the balanced germination, regeneration and growth of grasses, bushes, shrubs, trees and herbaceous pasture in the rangeland ecosystem. And also each Karrayu clans have their own rangelands in which the right to use the pasture was restricted (only the clan members have free right to access to the pasture) to reduce the pressure on rangelands. However, during the uncertainties through negotiation they could allow for other clan members for a defined time period. Mobility directly benefits rangeland management in a number of ways. It removes dead biomass and paving the way for fresh grass to sprout at the onset of the rains, prevent the liter plant (risk of colonization by unpalatable tree), disperse plant seeds, facilitating the germination of certain hard species that requires physical dispersal, breaks up hard soil crusts (facilitate infiltration and seed burial).

According to the woreda range land expert, in the present day Karrayu have undertaking natural resource management activities such as terracing, resting of the rangelands, reforestation, reseeding of grasses, water harvesting as a response mechanisms to mitigate the effects of the drought . Through house hold survey (as it is seen from the Table 19. % of house hold responses on natural resource management practices), 60 % of household responded as they were undertaking reseeding of grasses, reforestation and terracing on their private closure areas; and 51 % undertaking cut and carry system of grasses and agro-forestry practices, and 67 % of households were undertaking water harvesting, management of water points and controlled grazing systems on their farmlands, private closure area and communal grazing lands and water points in the present day. In general, when we compare the present and past natural resource management practice of the households, more households have undertaking natural resource management practice in the present day than in the past as a response to minimize the adverse effects of climate change (aggravated drought).



Table 19. Percentage of household responses on natural resource management practices

Management practice	Yaya		DireRedie		Total	
	Past	Present	Past	Present	Past	Present
Do you have undertaking terracing? Reforestation and reseedling of grasses?						
- Yes	32	53	39	67	35.5	60
- No	68	47	61	33	64.5	40
Do you have practicing water harvesting? Management of water points and controlled grazing system?						
- Yes	72	73	76	61	74	67
- No	28	27	24	39	26	33
Do you have practicing cut and carry system of grasses and agro- forestry practice?						
- Yes	13	44	22	58	17.5	51
- No	87	56	78	42	82.5	49
Range land burning						
- Yes	73		62		67.5	
- No	27	100	38	100	32.5	100

Source: House hold survey, 2010

Management of water points and controlled grazing system are undertaken more by pure pastoralist households (Yaya Village). Cut and carry system of grasses, Agro forestry practice, reforestation and reseedling of grasses are undertaken more by agro-pastoral households (Dire Redie village). It is found that in the present day range land burning is not practiced at all by both villages. The shortage of grasses by recurrent drought and degradation of the land deter the pastoralists from undertaking the rangeland burning as a means of conserving a meager available shrub, bushes, grasses and herbaceous pasture. According to the woreda pastoral development office 2001 annual report more than 250,000 different types of forest seedling was planted by the pastoral community on their farmland, communal grazing land and on the private closure areas.

Reduction of Consumption and use of Wild foods

Reduction of consumption and changing of composition of diet is also undertaken by karrayu pastoralists as a final resort or response to drought. According to Coppock (1994, 163) during the drought pastoralists take more cereals than milk and reduce their food intake. FGD, participants revealed that in the past an extent of reducing consumption as a response to conventional (usual) drought was low but in the present time consumption is reduced even during the normal period to only one time per day. The effects of present day drought are multidimensional in the study area;

it also eradicates many bush products that pastoralists used in the past during the critical time such as grasses, berries, and roots. They also explained that drought eradicates wild plants that are used by both human and livestock during drought – this also highly reduced the food intake rate of karrayu pastoralists' during the present day drought. According to the key informants, in drought period not only the quantity of food is decreased but also the quality is dropped due to lack of milk, especially, for children and elder its related health effect is dangerous. Through household survey 63 % of respondents also confirmed that there was no meal reduction as response mechanisms to conventional drought in the past. But 85 % (91 % from Yaya and 79 % from Dire Redie villages confirmed that as their extent of meal reduction as a modified response mechanisms to recent severe drought that is aggravated by climatic change is becoming high in the present day.

5.5.1.2 Non Pastoral Activity Responses

In the present day, more and more pastoralists are desperately looking for additional sources of income including non pastoral subsidiary activities which generate additional revenue during the normal years and spread risks at times of insecurity. Such activities may range from opportunistic farming, casual labor in urban areas, and commercial farms to selling of charcoal, firewood and wild fruits collection (Akliliu and Alebachew, 2009). Pre - 1980s severe drought, extent of responses to non pastoral activity was almost nil by the karrayu pastoralists' and they were devoted extremely on the pastoral activities. In the past, Livestock and livestock products were sufficient for household consumption requirements. However, in the present day due to loss of livestock by drought, pastoralists in the study areas have engaged in agriculture, collection and selling of fuel wood and charcoal, casual labor and trade as response mechanisms to drought

Crop cultivation

With change in the climate condition and uncertainties surrounding livestock production more and more pastoralists are shifting towards agro-pastoralist. In the present day crop cultivation is spreading to rangelands and areas that have never been under cultivation (Akliliu and Alebachew, 2009). As a response to drought events and food insecurity, in the present day, Karrayu engaged in crop cultivation. In the past cultivation was considered as an activity of distressed; poor pastoralists when they have been ejected from pastoral systems engaged in farming because of livestock loss to drought or disease. Informants indicated that karrayu have started rain fed

agriculture during the Derg regime after the 1977 severe drought; But the extent and coverage is increased more after the Abari (severe drought) of 2002 as a modified responses to drought that is aggravated due to climate change.

Through household survey out of 134 targeted sample households 109 of them have started (engaged in) agriculture as a response to drought. It was found that the objective of crop production is varying across wealth group. Informants indicated that the wealthy appeared to cultivate for avoiding of livestock liquidation to purchase grain, where as the poor cultivated to deal with food security. The land cultivated and the rate at which it expands may not pose serious problems to karrayu pastoralism in comparison to the quality of land it encroaches. According to the data from Oromia agricultural and rural development Bureau, from the total area of the woreda (133,963.6 hectares) the total cultivated area in 2008/9 under rain fed agriculture was 2021 hectares and under irrigation agriculture was 202.25 hectares which means < 2% of the total area of the woreda, but after the completion of the Fantale large scale irrigation project, the area that will be cultivated through irrigation may be rise up to 18,000 hectares. Although it is on a progress the construction of the irrigation canal was not installed up to the villages on which this study was undertaken for the time being.

Karrayu pastoralists' eagerly waiting the completion of irrigation canal and expecting, as it will resolve their current food security problem through undertaking both crop and forage production. Through house hold survey it was identified that in the last season 45 %, 52 % and 5 % of house hold from Yaya village cultivated 0.5, 0.6- 1, 1.1-2 hectares of maize, respectively, under rain fed agriculture where as 20 %, 54 % and 26 % of households from Dire Redie Village cultivated 0.5, 0.6-1, 1.1 -2 hectares of maize under rain fed agriculture. Regarding the yield 40 %, 56 % and 4 % of the Yaya village households produced <3, 4-6 and 7-9 quintal, respectively. And 36%, 55 % and 9% of households from Dire Redie Village households produced <3, 4-8, and 9-12 quintal, respectively, in the last season. Average farm size holding and engagement in agriculture is high in the agro-pastoral village than the pure pastoral village. An expert of woreda crop production explained that in both village cultivation of other crop type was not practiced due to the soil type and duration of the rainfall of the area. In addition, pastoralists claimed that as full sedentary agriculture is difficulty in the area. For example, on a certain plot of land crop is not growing for more than a season with out resting due to salt deposition. This indicates as the crop farming

(through both irrigation and rain fed) is not the sole solution as a response to drought. Instead it is an opportunity and help pastoral households as a means supplementation to pastoral activity income.

However, respondents claimed that since 2006 there was no harvest from rain fed agriculture because of late initiation, and early cessation of rainfall, lack of soil fertility, pest out break and effects of salt deposition. For example Ganna crop (Miaze) was completely devastated in 2008 by the army worm, ball worm, cutworm and stock borer break out that is caused by variation in daily temperature and by the late initiation and the early cessation of Ganna rainfall. Even though the irrigation is an opportunity for the karrayu pastoralists' in production of supplementary feed for the livestock and crop it is too difficult to entirely depend on it because of the soil characteristics of the area (deposition of salt in arid and semi-arid lands stunting plant growth on the second year of production) and climatic condition of the area.

Through household survey 78 % of household respondents confirmed that as they did not use agriculture as a usual response to drought in the past and 22 % of them responded that as their extent towards agriculture as a response mechanism to usual drought was low in the past. But in the present time 63 % of households responded that as their extent towards agriculture as a newly developed response mechanisms to drought that was aggravated by climate change is becoming high. An extent of the rest 15 %, 10 %, and 13 % respondents towards agriculture as a response mechanism is no, low and medium, respectively, in the present day.

However, still today, Karrayu obtained > 69 % of their annual income from livestock sales. For most Karrayu households, grain and other basic food items were the most important component of expenditure, and cash from the sale of livestock was the most important means of financing household expenditure. This indicates that even though majority of the pastoral household have been starting agriculture as a response to drought; high share of household income is generated from the pastoral activity in the present day.

Box 3. Case Study

Bokkuu Malka Ashanaa

Boku is one of the Agro pastoralists' in Gelcha PA. He is 38 years old. He has 5 children (3 male and 2 female). One female and one male have attending school. He said that I had 25 cattle (10 lactating cow, 3 oxen, 2 bulls, 10 heifers), 40 shoat and 3 camels and also I had farming up to 1 plot (0.5 hectare) of land before 10 years. I had sufficient milk from all of them (more than 2 liter from each cow, more than 0.5 liters from each shoat and more than 6 liter from each camel per day and 3 – 5 quintal maize at a season. Although I am young in a middle age group I have seen extreme variation in drought. The 2002 and subsequent drought is evil. Now I left only with emaciated 2 cow, 2 oxen and 3 heifer, 7 shoat; drought shattering them. When I had recalled the past live that I had seen, it looks to me just like a dream. No milk for the children, especially during the drought they have suffered with me, they are chanceless – drink dried coffee (hoja in local language) and eat dry maize injera at this stage. However, Now I practice farming more than the previous up to 4 plots, I am temporary daily worker of sugar cane plantation, and unlike in the past my wife has also sold butter when available to buy other items and she has also collected and sold fuel wood and charcoal. In addition, in the present day I have invested more on shoat than cattle.

Collection and selling of fuel wood and charcoal

The disposal of livelihood asset due to drought and drought related shocks forced the pastoral households to the collection and selling of the fuel wood and charcoal. Both key informant interview and focus group discussion participant revealed that in the past karrayu gave proud for the nature; nobody is cutting tree from the base (it is prohibited by the Gada system).

But depletion of asset by recurrent and prolonged drought (climate change) and lack of alternative livelihood option has led the Karrayu pastoralists' to the destruction of meager indigenous trees, collection and selling of fuel wood and charcoal. They explained their fear that, in the present day, an extent towards this activity is high; the deforestation of tree for this purpose may lead to sever degradation of natural resources. Through household survey the respondents confirmed that in the past none of them had participated in selling of fuel wood and charcoal. But in the present day 57 %, 19 %, 7 % and 17 % of respondents from Yaya village confirmed that as their extent of selling of fuel wood and charcoal as a modified responses (forced response to drought) to drought is no, low, medium and high, respectively. And 40 %, 20 %, 17 % and 23 % of respondents from Dire Redie village confirmed that as their extent of selling of fuel wood and charcoal is in the present day is no, low, medium and high, respectively. An extent of selling charcoal and fuel wood is high in agro-pastoral village than pastoral village. This indicates the increasing in severity of present day drought. According to informants from woreda Finance and

economic development office, in the present day, all wealth groups of the woreda are involved in making of charcoal and collection of fuel wood for selling. However, female headed households are entirely depending on this activity for their daily consumption due to disposal of asset by drought and lack of other alternative income for exchange of cereals.

Figure 13. Charcoal selling by the pastoralist households



Source: Field observation, 2010

Box 4. Case Study

Adilee Gadaa Hulluu

She is an agro pastoralist of Gelcha Keble, 35 years old, She has no husband. She has 2 male and 2 female children. One male is in school. She has started by saying that in the past live was good (misha in local language). In the past I had 15 lactating cows, 6 heifers, 30 shoat and I had no any camels or equines. Livestock provide more than enough milk for our daily consumption, we did not know this much about the cereals. Now condition was changed from time to time. God is not raining, sun is scorching and this sun scorch created new and expanded known disease of both livestock and human. Due to drought, disease and shortage of pasture I lost my livestock. Now condition is too shocking: I have only two emaciated lactating cows and 2 oxen, I have no shoats at all, and we do not expecting about milk as here before. I become dependent of relief food. With two of my children we have collected and have sold fuel wood and charcoal and we have exchanged with cereals. Before 3 years I had crop farming but now I have had not farming. Due to late initiation and early cessation of raining in the last 3 years, in the present day I have no harvesting at all. Now I have completely depended on relief aid and selling of fuel wood and charcoal

Causal Labor

Traditionally, karrayu gave priority, emphasis and proud to their pastoral activities, manage their livestock and when uncertainties happen to any of their member karrayu wires each other. But in the present time drought reduced herd size, deteriorated social support; made all equal and led the community to destitute and forced them to engage in causal labor (author interview, 2008). According to informants, slashing of the rail way side, temporary daily labor in sugar cane plantation, compilation and loading of sands were among the labor activities that were undertaken as a means of income generation by karayu pastoralists due to loss of the livestock and lack of other alternative viable livelihoods. Through household survey all of the respondents confirmed that none of them used causal labor as response to a conventional drought in the past. But 10 % and 17 % of respondents from Yaya village confirmed that as their extent towards causal labor is medium and high in the present day, respectively. And 15 % and 25 % of the respondents from Dire Redie village confirmed that as their extent towards causal labor is medium and high in the present day, respectively due to the complete disposal of livelihood asset (livestock). An extent towards causal labor is high in agro-pastoral village than pastoral village. FGD, participants also confirmed that as more than 50 % of annual income of 10 % of household in their PA is generated from the causal labor.

Trade

As Sandford and Habtu (2001) argued, pastoralists in Ethiopia in general have low level of earning income from non pastoral activities like petty trade. Similarly, karrayyu give less attention to non pastoral activities and their participation in trade is also almost nil. According to the FGD, participants until today no karrayyu have had any small, medium and big business centers from the woreda town in Matahara. However, as a response to drought in the present day karrayu pastoralists' have been starting petty trade and livestock trade in the village (buying and retailing after some time with in the village or selling in the woreda town) and women have started selling of butter and milk when available to purchase household utensils. Through household survey all respondents confirmed that in the past they had not undertaking trade as a response to drought. But in the present day 65 % of the respondents from the Dire Redie and 43 % of the households from the Yaya village confirmed that in the present day their extent towards trade is high. According to the informants from the woreda Finance and economic development

office, even though quantifying is difficult, all the wealth group of the pastoral households have undertaking a sort of small trade as a means of diversifying income sources and decreasing of livestock selling during both normal and drought time.

Box 5. Case Study

Tukuli Jiloo Dhadacha

He is an agro pastoralist in the Gelcha PA. He is a 53 years old. He has 4 children. He said that in the past I had 30 cows, 4 oxen, 3 bulls, and 12 heifers, several shoat and 17 lactating camels and also he had up to 3 plot of farming. There was adequate milk in the past; I had not acquainted with dearth in regard of household daily consumption. But now drought and disease crashing livestock; I have only 7 cows, 2 oxen, 2 heifers, 17 shoat, and 3 camels. Livestock could not proffer milk, especially during the drought period, I am ill with to endure them from the death. But Now I have expanded my farming up to 2.5 hectares, when the rain is good I have got up to 7 quintal of maize; my young children also occasionally take on trading of livestock. Unless I do not so, trusting only livestock in the present day led my family to privation

Box 6. Case Study

Roobee Baatii Jiloo

She is one of the pastoralists of Yaya Village. She is 43 years old woman; she has 3 male and 2 female children. 1 male and 1 female have been attending school. She said that in the past when my husband was alive we had 30 lactating cows, 2 bulls and 13 heifers, several shoat and 10 lactating camels. We had entirely depended on livestock product; there was sufficient milk from the entire livestock category. We had got more than 3 liters from a cow, more than 1 liter from shoats and up to more than 10 liters from a camel per day. But now Abari (severe drought) and disease killed livestock. I have only 5 lactating cows and 9 shoat and 1 camel. Milk is extremely decreased, Now we have fallen under relative assistances, we have friends from Addis Ababa and they have sent us money or cereals. And also PCDP Borrowed me 2000 birr and I have running a petty trade. And also I have started farming although a yield is decreased due to drought.

Asset disposal

In the past, livestock represents wealth and to a large extent considered as insurance of food security (livelihood) and description of social value among Karrayu pastoralists'. But now a days due to increased climatic shocks (severe drought), some pastoralists reached the stage of destitution because of complete assets disposal (loss of livestock by drought). According to Little et al., (2008) loss of livestock assets below a certain threshold translates pastoralists in to poverty in the absence of viable alternative livelihoods. According to the data obtained from the woreda food security office, in the present day 13 % of the woreda population is identified as destitute and treated through direct support of safety net pregame due to complete loss of physical capital

(livestock) by drought and related shocks. Through household survey 17% (7% from Yaya and 10% from Dire Reddie) of households confirmed that in the past we did not lost all our asset (livestock) because of responses (selling for daily consumption and death by drought) to drought but in the present they become **destitute** and completely loss all their asset through undertaking responses (through selling and loss of livestock due to severe drought) to current climatic shocks. Loss of asset is more in the agro-pastoral village than the pastoral village.

Generally, as shown on the Table 5, 80 %, 13.5 % and 6.5 % of annual income of pastoral village (Yaya) is from pastoral activities, non pastoral activities and food aid, respectively. And 57.5 %, 35.5 % and 7 % of annual income of agro-pastoral village (Dire Redie) is from pastoral activities, non pastoral activities and food aid respectively. Even though an extent is varied all of the household from both villages have been engaged in agriculture than the other non pastoral activities in the present day. Hence, depending on the results obtained from this section it is possible to develop a simple model that reflects karrayu households’ responses to sever drought (climate change shocks).

Table 20. A summary of an extent of households’ response mechanisms to drought in Yaya and Dire Redie villages in the past and in present day.

Stage of responses	Type of livelihood responses	Type of household activities (modified household activities)	Before 10 years an extent of responses to conventional drought	Now- an extent of modified responses to drought due to CC
1	Pastoral activity responses	Mobility	Medium	High
		Herd diversification	Low	High
		selling of large stocks and livestock products	No	Medium
		Herd splitting	High	Low
		Selling of small stocks	Medium	High
		Assistance from the relatives and communities(Social supports)	High	Low
		Collection of wild foods and meal reduction	Low	High
2	Non pastoral activities	Agriculture	Low	High
		Collection and selling of fuel wood and charcoal	No	High
		Petty trade	No	High
3	Asset disposal	Loss of asset (selling of whole livestock and household tools)	No	medium
4	Destitution	Causal labor, migration and employment on non secured activities and lack of moral	No	High

Source: Author (extracted and summarized from household survey responses, key informant interview and FGD, participants), 2010

As it can be seen from the table 13, in the present day, the pastoral mode of life of the study area is in continuous fluxes. In the present day, almost all wealth groups of the Karayu pastoralists' households have been undertaking non pastoral activities in a varied extent as a responses mechanism to drought risk reduction. The responses of the household are categorized at different stages and individual households have engaged in different types of the non pastoral activities in which the wealth of the individual is a decisive factor for engagement in any one /more/ of the type of the livelihood sources. As it can be seen from the above table, in the present day, individual household of the study areas are found at different stages of responses. Very few old pastoralists have limited themselves to the first stage and modifying their extent of response mechanisms through undertaking pastoral activities such as increasing an extent of mobility, increasing an extent of herd diversification, etc. But majority of the study area pastoralists have engaged simultaneously in the pastoral and non pastoral activities as a means of response mechanisms to drought risk reduction. The third stage of response is asset disposal. The pastoralists those who reach this stage are those who lost their livestock by both drought and selling for exchange of grains and/or those who could not able to respond to drought due to their livestock holding is below threshold level. And those who disposed their asset and could not get other productive livelihood option, is now employed in non secure activities and some are lose moral and out of any dimension of pastoral activities and addicted to chewing khat.

As it can be seen from the above table an extent of responses of the pastoralists in the study area to a set of pastoral and non pastoral activities are varied. For example, an extent of mobility and herd diversification is higher in the present day than in the past. Herd splitting and social support is high in the past and low in the present day. An extent of households towards agriculture, collection and selling of fuel wood and trade is high in the present day than the past. This indicated as the dimension of the pastoral mode of life of the study area is in a flux as a response and as a means of developing adaptation to the recent severe drought that is aggravated by climate change.

5.5.1.3 Factors Challenging Internal responses (Response of pastoralists) to drought

Factors challenging response of pastoralists to drought in the study area are complex and many, deep rooted and multidimensional which includes both natural and manmade factors. According to (Nori and Davies, 2006; Magrath, 2008) views, climate alone, even the more extreme climate

that will be caused by global warming is rarely the reason people fall in to poverty, it interacts with existing problems and challenges and makes them worse. It can be the trigger, but not the main cause, it is the same with the proverbial that “last straw that broke the camels’ back”. Effects of development projects, natural resource degradation, invasion of rangelands by unpalatable tree species, effects of lake Beseka, disease and pests, rainfall scarcity, household characteristics, poor infrastructure and conflict are among the major factors that were/are challenging response of the Karrayu pastoralists’ to drought as presented hereunder.

Adverse Effects of Development Project

Across many East African Countries, pastoral lands continues to be annexed for uses which are perceived as more productive, such as conservation parks, commercial agriculture, ranching, and tourism. Areas selected for appropriation are invariably the better and more strategic lands, such as wet lands and forests. This seriously undermines the capacity of the pastoral system to function properly (IID, 2009). Similarly, conversion of the Karrayu traditional pastoral territories, and the dry season grazing land in to conservation parks, commercial agriculture (Matahara Sugar Factory Plantation and Nuru Era Fruit plantation) has been greatly affecting and shrunken rangelands of the study area. According to key informants, more than 50,000 hectares of karrayu’s dry season grazing land was in appropriated by both commercial agriculture and conservation parks. Pastoralists are not allowed to graze and water their livestock at any time of the year against Oral promise that was given by the representative’s of Haile Selassi I during the establishment of commercial farming project.

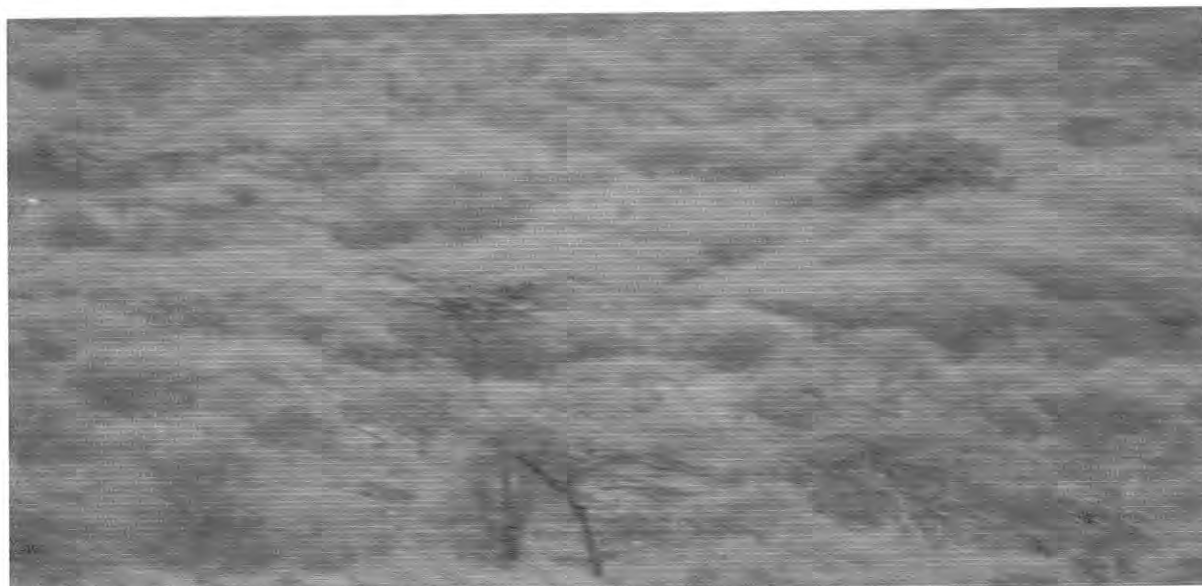
An expert from the woreda pastoral development office said that the pastoralists’ who are the owners of the land do not get any share or benefit from the revenue generated and no pastoralists’ employed both in the park and factories on the permanent bases. Furthermore, these agricultural projects have incorporating annually a minimum of 10 hectares of pasture lands in to its boundaries closing completely by plantation the route through which pastoralists have watering their livestock and grazing in the banks of the river during the drought period. The focus group participants also claimed that the factories have been affecting our livelihood in many directions. They have said that it in appropriate our traditional dry season grazing pasturelands; Karrayu have no natural water points other than Awash and rain fall. But the route to awash is closed by commercial farming plantation and rain is denied us. This has seriously affecting and challenging

our livelihood. In addition to the range land shrinkage, the waste that the factories have releasing also affecting our health and livestock; we asked them for the solution, but no any response is given at all from anybody. Furthermore, the factories representatives are less voluntary to employ karrayu residents at any level of available work. This indicates the multifaceted adverse effects that the induced development project has brought and seriously challenging the response of pastoralists to drought. Hence, concerned bodies should mediate and design sustainable strategies through which development intervention should not challenging livelihood of the communities and also through which it services local communities in reasonable manner. Through household survey it was found that all households from Dire Redie and 90 % from Yaya villages confirmed as there is an increasing trend in the shrinkage of the range lands due to the adverse effects of induced development project in the present day. Agro-pastoral village is more suffered than pastoral village by the adverse effects of the development project.

Shrinkage of Rangelands by unpalatable tree species

Currently, in addition to the effects of development intervention karrayu pasture land is shrunk, degraded and deteriorated rapidly by invasive, thorny unpalatable indigenous and exotic tree species. For example, 75 % of the Yaya and Dirree Redie villages are currently invaded by **Accacia depanelobium, Accacia melifera, A. seyal**. However, the negative impact of these native species is insignificant when compared with that of the most aggressive and harmful exotic rangeland encroacher-**Prosopis juliflora**. Focus group participant explained that during the Haile Selassie I regime and before that period when range land burning was undertaken encroachment of pasture lands by Acacia species was very low. Acacia was expanded during the Derg regime because of fire ban.

Figure 14: Invasion of rangelands by unpalatable tree species



Source: Authors field observations, 2010

In the present day recurrent drought and lack of pasture aggravate the invasion of acacia. Acacia tolerate drought and regenerate more and more during dry season and even more during drought period. According to FGD, participants, in the present day, shortages of pasture also deter range land burning in two ways. First, in the present day the ground below the bush crown or canopy is bare land or dust, it does not allow burning of the lands. Second, pastoralists themselves said that in past there was abundant pasture, this allowed us to burn pasture lands. But now if we burn the range lands, it affects the existing scarce grasses and browse. Regarding the **Prosopis juliflora**, focus group participants said that it is exotic species and came with wheat (food) aid. **Prosopis juliflora** is drought tolerant, regenerating through underground stem. It is difficult to eradicate, it requires a lot of resources; burning, slashing and uprooting could not control it. If one tries to uproot, any piece of detached parts regenerated and duplicated many times than the prior and invaded large areas of the pasture lands. According to data obtained from the woreda pastoral development office, in the present time more than 60 % of the total rangeland of the district is invaded by unpalatable tree species such as *A. melifera*, *A. seyal*, *A. nubica*, *A. reficiense*, *A. horrida*, and the most invasive exotic *prosopis juliflora*. According to my view the decrease in herd size due to death by drought is also aggravated the expansion of the trees. If pasture is not grazed appropriately and timely; it favors the growth of bush which finally ends up with the

elimination of grasses and herbaceous pastures. Through household survey all respondents from both villages confirmed that as an invasion of rangelands by unpalatable trees have seriously caused pasture scarcity.

Natural Resource Degradation

Dry land ecosystems are valuable and unique. They are able to maintain soil fertility hold water and maintain water and air quality, control erosion, protect against storms and landslides and also sequester carbon. This complex system harbor key natural resources, including species adapted to dry land conditions. The degradation and/or loss of these resources would reduce responses that are undertaken to drought and resilience options (Shackleton et al., 2008). Currently, wind and water erosion degraded the Karrayu rangelands in an alarming rate. Ground cover (grass) and the indigenous vegetation which minimize erosion is lost by recurrent drought, overgrazing, cutting of tree for fuel and charcoal, cracking and re cracking of the rangeland by volcanic pressure, expansion of farming and population pressure, are among the factors which are resulting in degradation of range lands. For example, in the present day 43% of households from both villages cutting tree for fuel wood and charcoal selling, more than 50 hectares of land in the Yaya village is barren land due to the cracking and re cracking that is caused by volcanic pressure, the entire ground of the range land in the village is bare and highly susceptible and affected by both wind and water erosion.

The recurrent drought declined the germination, growth, sprouting and regeneration capacity of nutritious grass and other tree species adapted to the study area. A Fantale woreda range land expert explained that in the present day an increase in severity and frequency of the drought coupled with other land use systems minimized the land cover, exposed the shallow upper top soil to erosion and this resulted in declining of infiltration of available meager moisture due to the loss of upper top soil. As it is known the loss of upper top soil decrease infiltration of moisture and leads available meager moisture obtained through rain within a short period of time to over running (erosion) and resulted in degradation of rangelands through formation of splash, sheet and gully erosion and expansion of barren land. The problem is unlike the high land it is difficult and requires a time for the rehabilitation of the ecosystem in a series of ecological succession in to its original state; due to the scarcity of the moisture and low fertility of the soil. All



respondents from both villages confirmed that as natural resource degradation in their village is in increasing trend.

Figure 15: Rangeland degradation



Source: Field observation, 2010

According to the data obtained from the district pastoral development office, more than 50 % of the rangeland is barren due to drought and erosion (both wind and water erosion). All the household respondents from both villages also confirmed the increasing trend in degradation of the natural resources in their area. As it is known rangeland, water and pastoralists life is interconnected. However, in the present day, the cumulative effects of both natural and man made factors has seriously degraded the karrayu rangelands, which is one of the major pillars of physical capital of karrayu pastoralists. Hence, it is greatly challenging the responses that are undertaken by the pastoral households to drought. Upper top soil is exposed to both wind and water erosion due to the loss of cover plants by recurrent and recent severe drought and this loss of upper top soil decreases moisture infiltration due to the low infiltration capacity of the B-horizon soil characteristics which leads to over running and finally end up with the pasture scarcity and degradation of the rangelands in an alarming rate.

The Effects of Lake Besaka

The expansion of Lake Besaka is resulted in shrinkage of range lands of the study area. The lake is expanded annually at an average of 3 km² in to the pasture lands (UNDP, 2002). The focus group participants badly claimed that the lake is not used both for human and livestock drinking purposes, it increased highly from year to year and if livestock is spontaneously used; it killed the livestock immediately. And they also claimed that the expansion of the lake is aggravated by the Methehara sugar factory liquid waste disposal. Starting from its establishment, the liquid waste of the factory is directed and disposed to the lake which is also a reason for the expansion of the lake into the pasture lands. An expert from the woreda also said that the expansion of the lake is not only danger for the pasture lands but it put the sustainability of Mathahara town and surrounding village under question even in the present day. According to the data obtained from the woreda pastoral development office, the present day total area of the Lake Beseka is 3800 hectares.

Disease and Pests

Climate change has direct and indirect impacts on the prevalence and spread of diseases and pests (Aklilu and Alebachew, 2009). The severity, frequency, and expansion of existing disease and break out of unknown disease of both human and livestock were experienced in the study area. For example according to the FGD, participants head ache, trachoma, skin disease and allergic are the most recent severe diseases that are highly aggravated by drought due to lack of sanitation, and increase in hotness of the sun. According to the 2008/9 annual report of Fantale District health office malaria, diarrhea, STD, Typhoid fever and intestinal parasites are the most common human diseases to the area which are currently increased both in severity and expansion due to the severity of the drought and lack of appropriate diet.

In the pastoral areas of Oromia existing and newly emerged livestock diseases are causing more illness and livestock death. The major common livestock disease that are known in the Fantale districts includes: Bacterial diseases (Black leg, Anthrax, pastorallosis, contagious bovine, pleura pneumonia, contagious caprine pleuropneumonia); Viral diseases (limphy, skin disease, African horse sickness, pestae despetits ruminants, foot and mouth disease, sheep and goat pox); Protozal

diseases (Trypanosomiasis and babesiosis, parasite (-internal and external parasite) are aggravated and expanded by the severity of the drought in the present day (OPADC, 2009).

The unknown new camel disease outbreak that was resulting in loss of camel was observed in Fantale Woreda of Oromia in 2005 (OPADC, 2008). According to OPADC, the first wave of the unknown camel death disease outbreak was emerged in November 2005 in Fantale pastoral woreda of Oromia. The second, third and the fourth wave of the breakout of the disease was observed in Gola Oda in 2005, in Mayu muluke in 2006, and in liben districts of Gudji Zone in 2007, respectively. According to Fantale Woreda livestock expert the symptom of the disease is sudden death, bloated carcass, bloods oozing out from the natural orifices after death (see figure13). The disease is resulting mostly in death of lactating, pregnant, and recently calved camels. According to the FGD, participants during the first outbreak of the disease, in the 2005 alone 11 herd (locally called bitama) having 100 – 150 camels were lost. Even still today treatment method is not identified regarding sudden death camel disease and it is continuously challenging the area.

With recurrent and extended drought, existing and newly emerged livestock disease is causing more illness and livestock deaths. Here before pastoralists of the study areas have promised camels and goats in their capacity to tolerate and escape drought. However, the increase in severity of drought, and the lack of cold water for a long period of time heavily affecting the heads of the goats (unable to keep balance) and resulting in madness or foolishness (locally called Jinni) and immediate deaths of the goats during the severe drought.

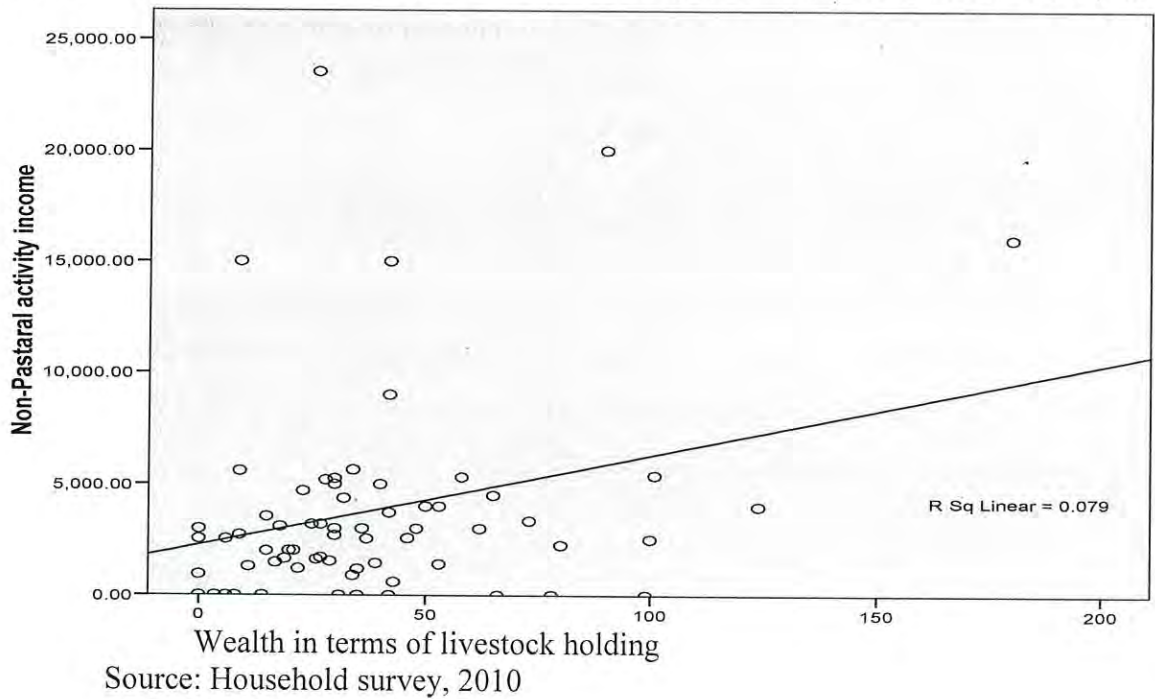
Increasing in frequency and severity of the drought, variations in temperature and moisture stress aggravated the expansion and frequency of both endemic and epidemic crop pests in the study area. According to informants, the shortages of moisture and variations in daily temperatures resulted in invasion and expansion of field crop by pest. For example in 2008, the Gannaa season crop was completely devastated due to the sporadic pest break out – army worm (*spodoptera exampta*). And also the pastoralists bitterly claimed the increase in expansion and the severity of pest due to the subsequent invasion of their meager crop by cut worms, stock borer, smut, rust, trips, and aphids. Through household survey 83 % of the household in both village confirmed that break out and expansion of both human and livestock disease is more severe in the present day than in the past. This indicates as the increase in frequency and severity of drought due to

climate change has increased an expansion of endemic and epidemic diseases and formation of unknown disease to the area. In addition expansion of new exotic weeds such as parthineum and striga is seriously challenging the area. Both parthinum and striga are highly drought tolerant and could able to grow during the dry season and even during the drought year which makes good opportunity for it to invade large area within a short period of time. These and other cumulative effects of the present day severe drought have seriously challenged the response of pastoralists in the study area to drought.

Household Characteristics

Poor pastoralists are less able to respond to challenges due to a lack of asset. Both poor and rich respond to disaster, the main difference is that response is a positive investment for the rich but the poor are forced to scatter their efforts to meet household needs and at a certain point fall in a vicious cycle of poverty (Homewood, 2008). As it is seen from the figure 14, displayed scattered plot diagram, household income from non pastoral activity has positive linear relation with the wealth of the households of the study area in terms of livestock holding up to a certain point. As a wealth of the household is increasing , income from the non pastoral activity also show increasing trend up to a certain point and as wealth of the household decreasing in terms of the livestock holding income from non pastoral activity showing a decreasing in an increasing trend.

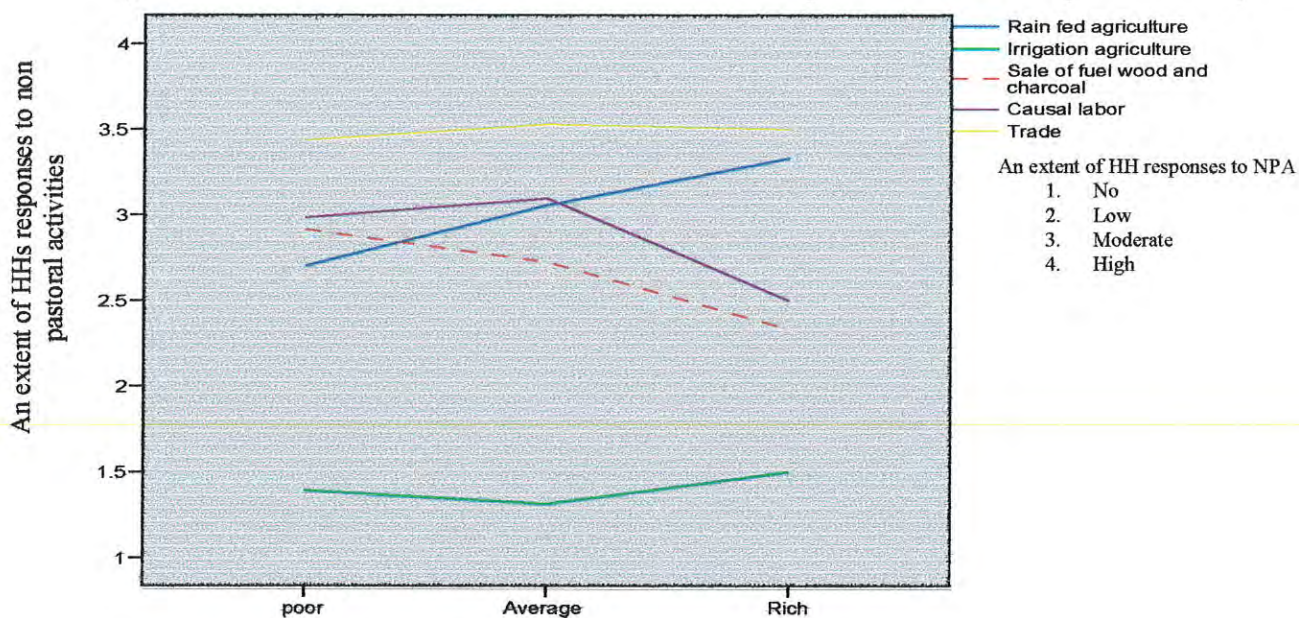
Figure 16. The relation of wealth (in terms of livestock) and Annual non pastoral activity income



As it can be seen from the scattered plot diagram, annual income from non pastoral activity is showing a strong correlation with livestock size for those household holding livestock up to 50 (as described in section 4.3.2, present day mean livestock holding of the household of the Yaya and Dire Redie villages of Karrayu were 39.2) but after that showing a weak correlation. This indicates as the wealth of the household in terms of the livestock holding up to a certain point is the decisive factors to undertake appropriate and productive response mechanisms to spread the adverse effects of drought and to increase household income. However, household annual income from non pastoral activities are showing a decreasing trend after certain point as the wealth of the households in terms of livestock holding is increasing. This is due to the fact that even though livestock holding is decisive factors to undertake appropriate responses to drought through an income obtained from the pastoral activities, as the livestock holding of the household is becoming above mean, income from the non pastoral activity is decreased due to the household labor is detained on pastoral activities. In addition, as it can be seen from the Figure 17, as livestock holding of the household is increasing an extent of household to non pastoral activity other than agriculture is showing a decreasing extent. This indicates an extent of the households towards the sale of fuel wood and charcoal and causal labor is show a decreasing trend (low) among the middle and rich wealth groups (in terms of the livestock holding). This is also additional fact for the weak correlation between the mean of household annual incomes from the non pastoral activities and livestock holding of the households above a certain point, especially, among the rich households. From the total household livestock size, in the present day, more than 65 % is small stock. This also has its own negative impacts because of the price of one steer cattle can equal with the price of 10 small stocks.

As it can be seen from the Figure (17) 1, 2, 3, 4 is an extent of HH to non pastoral activities that stands for no, low, moderate and high, respectively. Engagement of households in rain fed agriculture and household wealth (in terms of livestock holding) is showing a positive linear relationship.

Figure 17. Relation of HHH wealth to an extent of HHH responses to a set of non pastoral activity

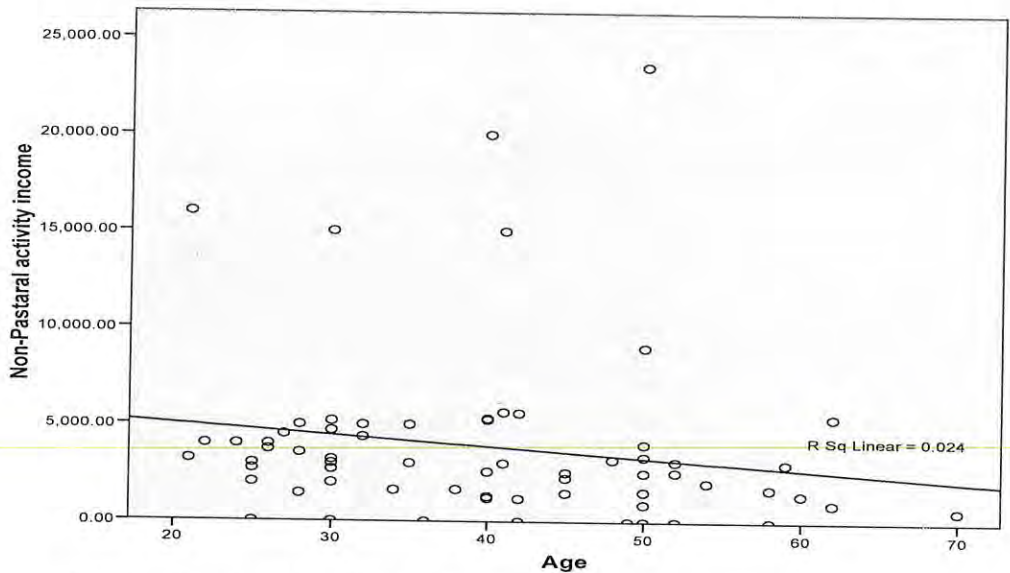


Wealth in terms of livestock holding

Source: Household survey, 2010

As wealth of the household is increasing, simultaneously an extent of the HH towards agriculture as response mechanisms to drought is also increasing. However, as wealth of the household is increasing an extent of the HH towards collection, and burning; and selling of fuel wood and charcoal is decreasing. In other cases an extent of the households towards causal labor is showing an increasing trend up to a middle wealth group; and after that showing a decreasing in an increasing trend among the rich households. This clearly indicates as the household wealth, in terms of livestock holding is the decisive factors for the involvement of the households in productive activities that are more fundamental for asset building. In addition, rich pastoral households have used their labor exhaustively for their own pastoral activities and other productive activities such as agriculture and trade and due to this they have no excess labor that participated in the causal. The extent of all wealth groups towards trade is high and an extent of all wealth groups towards trade is more or less equal in the study area. This indicates as there is a weak correlation between the HHs wealth and an extent of the HHs to trade due to the fact that the poor were also participated in petty trade as a response to drought. Since for the time being the irrigation is not available in both villages, an extent of all wealth groups is equal (since it is below 2 as it seen from the Y-axis of the figure an extent of all wealth groups is fall in 1 which means no extent).

Figure 18. Relation of HHH age and income from non pastoral activity (NPA)



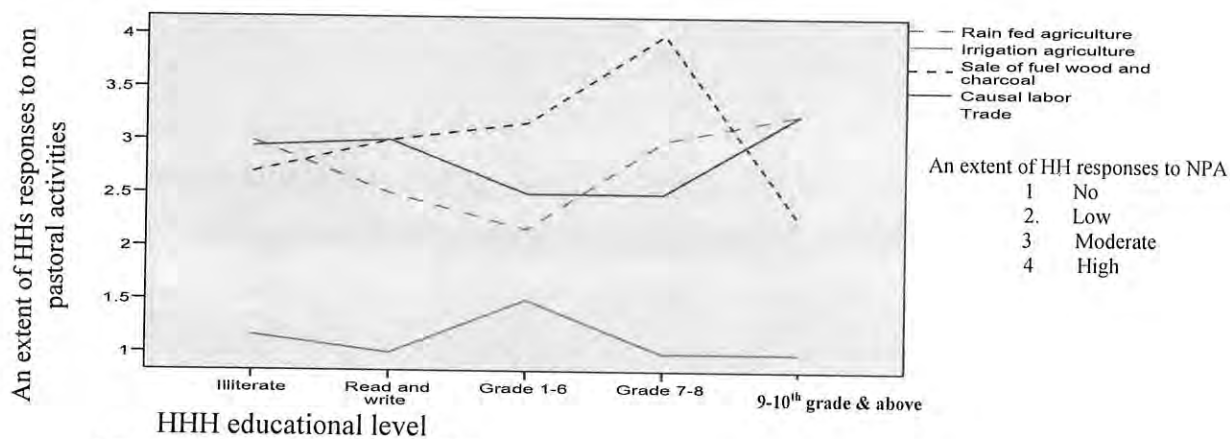
Source: Household Survey, 2010

As it is seen from the figure 18, the scattered plot diagram, there is a negative relationship between the variables; as the age of the household head of the study area is increasing, income from non pastoral activity are showing a decreasing trend especially for the majority of the aged households. As it can be seen from the scattered plot diagram very few households above the age 50 years have mean annual income of more than 5,000 birr when compared with the households below 50 years. This indicates that the aged household response through non pastoral activity to drought is low which means age of the household is one of the challenging factors in undertaking appropriate responses to the recent severe drought. As it is known household head is a sole decision maker in rural area and increase in household age limited the decision of the HHH to undertake appropriate response mechanisms to drought and to increase the household income other than the income from the non pastoral activity.

As it can be seen from the figure 19, as HHH educational level is increasing an extent of the household head towards agriculture, trade and causal labor showing decreasing slowly up to a certain point ,especially, up to grade 6 and then after it start increasing. As HHH educational level is increasing an extent of HHH responses to collection and sale of fuel wood and charcoal is show increasing up a certain point, especially, up to grade 7 and then after it is decreasing in an increasing rate. This indicates as the educational level of the HHH is increasing, HH developed positive attitude towards environment. And also as the educational level of the HHH is increasing

engagement of the HH in more productive activity is improved. The reason why there is positive relation between the level of education and an extent of the HH towards labor and/or causal labor is there are some literate households' head that have engaged in daily labor in plantation from Dire Redie village. This indicates as the educational level of the HHH is a decisive factor in elevating an extent of HH responses to a set of non pastoral activities.

Figure 19. Relationship of HHH educational level to an extent of HHH responses to a set of non pastoral activities



Source: Household Survey, 2010

Rain Fall Scarcity

Karayyu pastoralists have been starting rain fed agriculture to supplement their livelihood that is deteriorated by loss of livestock due to drought. However, in the past three years there was no / little harvest from agriculture due to the late on set and early cessation of rainfall which resulted in loss of resources. Such as labor and seed cost that was used for the purchase of the farming items. In addition, the focus group participants said that even with the availability of rain there is no yield at all from the same pieces of land in the second season. This is because of two reasons. First, as it is known the low land soil is saturated by salt and deposition of this salt stunting the growing of crops. Second, in the low land area there is scarcity of moisture and decomposition rate is very low; due to this the fertility of upper top soil that support plant growth decreased within a short period of time and this resulted in stunting or weakening of plant growth.

Poor Infrastructure

The development of basic infrastructure especially health center, water supply, road, market, etc is at an infant stage in the woreda in general and for the study sites in particular. Skill and education will increase adaptive capacity to climate change and options for diversification; and

will allow the freedom to make the wider use of opportunities based on dry lands' natural resources. However, pastoralists in the study area are subjected to critical shocks, with lack of rainfall which resulting in a high risk of famine due to the declining in livestock products in an increasing rate and due to the lack of alternative livelihood options. Coupled with these, high illiteracy rate, low primary school enrolment, high dropout and repetition rates, lack of water, inadequate health service, human and livestock disease, population pressure, poor roads, and markets net works challenges the responses that are undertaken by Karrayu pastoralists' to drought (WFAEDO, 2010).

Through household survey it is identified that 91.3% of the Yaya village respondents and 84.1% of the Dire Redie village respondents could not able to read and write. FGD, participants indicated that in the past regime Karrayu pastoralists' were neglected and marginalized from all aspects of social, economic and political affairs and there was no school in the rural areas during both the H/Silase and Derg regime except the school that was established at the woreda town for the purpose of servicing sugar factory center. Data obtained from the educational office of the East Showa zone also stated that as there was only 1 junior secondary school (1-8) in 1991 in the Woreda and educational coverage at that time was also below 1 %. As a climatic conditions change in the dry lands and become more sever, education allow pastoralists the freedom to supplement livestock keeping with other livelihood options which may not be affected by extreme drought or flooding or to move away from pastoralism as no cost to themselves or to others (Devereux, 2006). But lack of education is highly challenging the pastoralists in the study area to undertake appropriate responses to drought.

Regarding both human and livestock health service, FGD, participant said that even in the present time there is no any health service available in their village or PA and they have subjected to move to woreda town to get health service. The adverse effects of livestock diseases are aggravated during the drought time. Lack of pasture and water decreases the resistant capacity of livestock and make them easily susceptible to disease. But the accessibility and availability of veterinary service is poor in the study area. Informants, confirmed that even though both human and livestock health post availability is on a progress (both PA under the study has no both health post); in the woreda service delivering is still poor. Through household survey all the respondents from both villages confirmed that as there is no any health service available in their village. The

lack of water is the main serious challenging factors in the study area. For example in Yaya village there are 1 cistern and 1 shallow well. But during this study the cistern is dried up; and the shallow well is seldom providing some water. And also 1 pond and 1 cistern that is found in Dire Redie village is dried up due the drought when this study is undertaken.

Physical access to markets is often a stumbling block for market participation in the study site. FGD, participants confirmed that Karrayu pastoralists are suffering in lack of alternative market centers from their village/pastoral area and they have subjected to come to the Matahara market which is the only market center of the woreda. According to (Moretimore et al., 2008), Poor and scarce infrastructure and difficult transportation options put pastoralists at a distant disadvantage as they may not be able to make marketing decisions that would allow them to best respond to drought conditions, resulting in the unnecessary loss of livestock assets or the scale of asset at a loss. Pastoralists in the study area could not get market information and also they sale their livestock to the middlemen that reduce the income which pastoralists get from their livestock.

Effects on Women and the children

Climate change induced hazards create additional burdens on women in many ways and make them vulnerable to its impacts. The problems associated with climate change not only affect women but also children. At times when part of the family is moving, usually women and children remain behind. Pastoral women have several responsibilities; taking care of children, managing young calves, looking after sick and old livestock, milking livestock, fetching water and collecting fire wood, and cooking. Though women shoulder the family responsibility they cannot take critical decisions on the remaining household resources, mainly livestock. They cannot sell livestock at times of even most need (Aklilu and Alebachew, 2009). Women of the study area play a major role in the response to hazards on their environment by actively entailing in implementation of the coping mechanisms as managing young and sick animals and small ruminants, water harvesting and bush clearing. In other words, they are obliged to shoulder much heavier workloads, being primarily responsible for the domestic activities basically considered to be the exclusive responsibilities of women and girls. FGD, women participants indicated that increase in drought aggravate the burden on pastoralists' women. They badly claimed that we prepare the food, and arrived it at to where the males are looking after the livestock – this place is unlike here before it takes us a long distance traveling up to Shashamane, Mojo and Boset; this is

our routine activity especially during drought period and at least we undertake twice traveling in a week. In addition, during drought period the borehole and the cisterns on which we depend is dried up during the drought period, we are subjected to move to woreda town that is more than 15 km to buy water that is mandatory for both livestock and human.

Through household survey all respondents from both villages confirmed that as there is no water available in their village and also all respondents from the both village confirmed that as they are subjected to travel more than 10 km from their village to get water for both human and for the livestock those could not able to move to distance places due to drying up of borehole and cisterns during dry season. The pastoralists of the study area are dependent on unpredictable borehole and cisterns for their water requirements – which is the serious challenge for both women and their children since this routine task is considered to be as their responsibilities; and it is hardly available even during the normal drought period. Informants raised that, drought has a great effect on the students of the study area; even during the normal drought period students are not properly attending the school (high absenteeism from class) to manage livestock with their parents and during the severe drought period those who attending the class could not able to follow properly due to malnutrition and physical fatigue. A data obtained from the woreda education office revealed that as there was an increasing in school dropout during the severe drought of 2006 and 2008 reached up to 25 % and 23 %, respectively. In addition, according to the studies undertaken by UNDP (2002), 36 % of the primary school students of the woreda registered in September 2001 did not attend final exams in 2002 when compared with previous academic year 10 % drop out. These indicate the adverse effects that drought has posed on the pastoralists' children.

Furthermore, karrayu pastoralists' young male are not allowed to marry until more than 35 years due to the anticipation that if married it reduce mobility with livestock and also reluctant to confront with the hostile neighbors ethnic group - this also load an extra burdens on women of karrayu pastoralists. This and other factors are deterring the involvement of karrayu girls to follow school and make them to dedicate on the household activities that is expected as their given duty (Authors interview with woman karrayu DA, 2010). For example data from the Zonal education office which revealed school enrollment show that from the total 1,713 students registered for the 2007/8 academic year the total number of female is only 370 which is below

20 % of the total. According to woreda Women affairs office, due to the fact that the customary institutions predominantly controlled by men, females of the study areas are economically subordinated and made to lack of control over sources of income, and to have only secondary control over households' income. Hence, even in the present day their sources of income limited to selling of dairy products, fuel wood, handicrafts, and petty trading while men control the proceeds from the sale of large stock.

Weakening of traditional Institution

Statutory governance institutions are based on received wisdom that does not fully recognize or understand the need for pastoral communities. Statutory governance institutions, especially at the local level, are often weak or inaccessible to local people. For example, customary tenure systems operate in parallel with state institutions, which results in contradictory rules and competing authorities (Mortimore et al., 2008). This legal pluralism showcases a 'gap' between customary regulations and state legislation (Dyer, 2008), and continued intervention of the state in customary resource tenure and its administration is slowly reducing customary institutions. Pastoralists of the study area used in the past negotiation, reciprocity and building strong social bonds and net works as fundamental processes which allow them to better manage the dry lands through their traditional Geda system which is equivalent with the present democracy.

However, the Geda system in which the Kereyu Oromo community used for their entire social, economic, cultural, environmental, and political affairs is not properly functional in the present day. FGD, participants stated that the decline in Geda system during the Derg period have caused multi-dimensional effects on the Karrayu community; it decrease the social support, the resource management system and the conflict management strategies and resulted in declining of the traditional drought coping strategies of the community. Key informants confirmed that the ban of rangeland burning during the Derg regime without consent of the area converted the rangelands to bush and thorny unpalatable species. Through household survey 53% of respondents from Yaya Village and 62 % of respondents from Dire Redie village responded that as the increasing in weakening of the traditional institution seriously challenges the responses that they are undertaken to drought.

Conflict

Conflicts over range land resources mainly grazing land and water points have contributed to the decline in the rangeland resources. Conflicts not only reduce the resources, but also cost human and livestock losses as well as destruction of resources (PFE, 2006). Frequent resource based conflicts and displacement have been associated with problems of malnutrition, inadequate water, low resistance to disease, and repeated disease epidemics. There is continuous and unsettled hostility and conflict between Karrayu and other neighbor clan such as Amahara, Argoba, and Afar (Karrayu called Adal) on pasture lands and water points. According to the information from focus group discussion participants there is continuous loss of cattle by Adal due to the conflict and cattle raiding. According to Ayalew (2001), the tribal group of Afar known as Debine pushing further to south the karrayu Pastoralists' due to they loss their pasturelands by commercial farming. As a result the dry season grazing areas of Karrayu Oromo such as Sifie, Silkie, Tafie, and the banks of the Kesem river, which were already densely stocked and settled have become in continuous confrontations with inter ethnic clashes between the Karrayu and Debine Afar. Example, according to the FGD, participants, in 2007 and 2009 Karrayu lost 1844, and 2375 livestock, respectively, by both conflict and cattle raiding caused by Afar. In addition, there is continuous loss of 10-50 cattle with in a month or three month period by Afar raiders. Therefore conflict is among the major deterring factors that are challenging the responses that are undertaken by Dhega Hedu and Dire Redie pastoralists of Fentale woreda. According to the same authors the Karrayu also came in to conflict with the debine Afar on their own traditional rangelands of Gebaba plain that is found between the great and little Fentales. In addition, the dry season grazing areas of Karrayu inside the Awash national park boundaries (Beleadi, Aroreti, and Dinkuku pond are also locations of frequent clashes between the Afar and Karrayu. In such circumstances the Karrayu pastoralists often send scouting parties (selfa) before they graze their livestock there and water them at the Dinkuku pond.

According to the FGD, participants there is still continuous conflict with the Argoba on the rangelands and water points and the confrontations leads to cattle raiding, physical damage and loss of lives especially on the Arole rangelands which is located to the east of the Sabober planin that include areas such as Eso, Haya, Ledi Roba, Haro Hubo, Harro Harba – total known as the

Arole rangelands. In addition, according to the participants there is also conflict between Argoba and Karrayu on the grazing areas along the banks of Kesem River.

Toxic water and chemicals

According to information given by woreda water development experts Agro-industries such as large irrigated agriculture, chemical factories, slaughter houses and the skin/hide processing plants are located close to the tributaries of Awash and Awash River that crosses the Karrayu pastoralists. The plants produce toxic chemicals and wastes directly to the rivers. As a result, people and livestock who consume the river water face health difficulties and suffer from the toxic elements discharged to the river. According to FGD, participants there is a continuous serious challenges to the Karrayu pastoralists because of skin, internal health problems, as well as livestock and human death that caused by the contaminated river water.

5.5.2 External Responses

External responses are the responses that are undertaken by the external agents such as Government and NGOs to reduce the adverse effects of the drought on the pastoralists of the study area. External agents are mainly involved in the areas of emergency aid, early warning and livelihood diversification and expansion of infrastructure.

5.5.2.1 Government Responses

A drought response in Ethiopia is regulated by the government's 1993 national policy for disaster prevention, preparedness and management (Government of Ethiopia, 1993). Pastoral community development project (PCDP) was formed under the ministry of federal affairs in 2007 in the aim of undertaking holistic development activities in the pastoral areas of the country. Pastoral standing committee was assigned in the parliament in 2007 for the purpose of addressing and following pastoral areas affairs. Oromia regional government established Oromia pastoral area development commission in 2002 in order to address and coordinate the holistic and multifaceted development problem of the Oromia pastoralists' (OPADC, 2007).

Currently, government have undertaking emergency aid, livelihood diversification, expansion of social and economic infrastructure, early warning, conflict management and resolution in the Fentale pastoral woreda to diversify the livelihood base through promoting sedentary life. However, still due attention is not given to solve the factors that are seriously challenging responses that are undertaken by pastoralists to drought.

Livelihood Diversification

The Oromia regional state launched the programme of corridor development in 2006 in rural areas of Oromia in general and in Oromia pastoral areas in particular to improve the livelihood base of the community. The components of the programme include irrigation development, water development, range land development, crop production, livestock development, market and micro enterprise development and expansion of infrastructure in the pastoral woreda of the region. For example, Fantale irrigation project that will cover 11 PA of the woreda and designed to develop 18,000 hectares of the land is started in 2007 and is now on a progress. Starting from the 2008, more than 600 households in three kebeles of the woreda have been benefited from the irrigation and produce different agricultural crops such as maize, onion, potato and tomato and become food secured (WPDO, 2010). Focus group participants said that when the irrigation water reach all the anticipated PAs of the woreda the livelihood problem of the community will be solved in certain extent through production of fodder and crop to supplement our pastoral activity income. However, complete dependence on agriculture is unattainable due to the climatic condition and soil characteristics of the lowlands. They have said that due to salt deposition, after one harvest a given plot of land will require up to two resting season to cultivate crop or forage. They have said that unless attention is simultaneously given to both pastoral and non pastoral activity promising only non pastoral activity as a response to drought is risky task in this difficulty environment.

Figure 20: Fantale Irrigation project



Source : OPADC, 2010

In addition Fentale woreda cooperative office organized destitute pastoralists' household for undertaking activities that are intended for diversification of the livelihood base of the pastoral households and to reduce the problem of food security. According to the woreda cooperative office starting from 2008, pastoral households in Dimbiba villages of Dhega Hedu Keble were organized to supply stone and sand for different organization (private, GOs, and NGOs) those undertaking construction activities in the woreda. For example, 51 pastoral households in Dimbiba zone of Dhaga Hedu PA, that is 8 k ms far away from the woreda town have bought a car and are renting for transportation of sand and stone after working in loading and unloading of sand in their village for one year. Furthermore, they are on a process to buying the second car (WCO, 2010). Informants from the woreda pastoral development office said that there is a good starting and commitment from both the government and community side to diversify the livelihood of the pastoral community through using different alternatives to minimize the risk of drought. But the neighbor pastoral village and PA claimed that the organizational base of the enterprise is area specific and it does not take into account the neighbor villages or PA.

Asset protection and livelihood support

Protection of household and community assets reduces vulnerability to the impacts of climate change. Households that have lost all or most of their livestock resources due to droughts, flood hazards, disease outbreaks and conflicts may face serious challenges that could eventually expose them to destitution. Since, 2004, the national governments introduced a productive safety net program basically aimed for the prevention and creation of household and community assets in food insecure and vulnerable woredas of the country (Aklilu and Alebachew, 2009). In this regard, safety net program is undertaken in two categories such as public work participation (food for work programme) and direct support programme in the study area. In the productive safety net programme the beneficiaries have participated in different productive public activities which include pasture management, natural resource conservation (construction of check dam and terracing), rural road maintenance, nursery management and water harvesting. Under the direct support program elder, female headed household and disabled group of the communities are supported for the aim of capacitating and building their asset base and also to protect from vulnerability (OPDC, 2008). As it is depicted in table 16, according to (WFSO, 2010) the total beneficiaries of the woreda population in safety net program for the last 3 years is 15,760, 15,760

and 14,132 in 2007, 2008 and 2009, respectively. Through household survey it is identified that 27 % of the households are beneficiaries of safety net programme in the last three years.

Emergency Aid

The government of Ethiopia has since long been engaged in supplying emergency aid to victims of various types of disasters (Aklilu and Alebachew, 2009). Starting from H/Silase regime in 1947, 1955 and 1963 drought and during the Derg regime in 1977 and 1984 drought and in the current regime in 1994, 2002 and subsequent drought government have been supplying different kinds of emergency aid such as food, feed, water, crop seed, human and livestock medicine for the Fantale pastoralists (OPADC, 2008). For example in 2008, severe drought 15,000 bundle of grasses were transported and distributed for 2011 households by the oromia pastoral area development commission. Through this study it is identified that 39 percent (37% from Yaya and 43% from Dire Redie village) of the households were beneficiaries of emergency aid in the last year. FGD, participants accredited the government emergency aid that is undertaken during the severe drought but they claimed that the inadequacy and the timing of the emergency responses.

Social and economic infrastructure

The expansion of social and economic infrastructures such as, school, roads, telecommunication, water development , market centers are a decisive factor for the reduction of poverty in general and for the reduction of any hazardous. In the present time government has established /constructed / primary school in all the PA of pastoralists. In addition, currently, high demand is observed for education from pastoralists. Pastoralists have seen the strategic importance of education as a means of diversification of their vulnerable livelihoods because they have realized that at least their children can get employment if they are educated (PFE, 2007).

Currently, in all the PA of the Fantale pastoral woreda primary school is established and at least one child of each pastoralist's household is on attending primary school. In the present time there is an increasing trend in the school enrolment from year to year. For example, gross school enrolment increased from 25 % in 2006 to 57 in 2010 (WEO, 2010). FGD and KII, participants confirmed that as the availability of primary school in their village/PA in the present time is satisfactory. But all of them complain that there is still a great problem in the expansion of roads, water and market infrastructure development. They have said that there is only one market center that is found in the woreda town (Mata Hara) for all of karrayyu pastoralists to sale their livestock

and livestock products and karrayyu pastoralists travel long distances on foot to get market and they have also said that except the main road that cross the Fantale woreda all the roads are dry season road and poorly developed.

Disaster prevention and management

In disaster prone areas, the role of government in disaster prevention and risk management is very crucial (Aklilu and alebachew, 2009). In all the four levels of the current government structure responsible and accountable bodies were assigned to undertake disaster prevention and management. At federal, regional and woreda level disaster prevention and preparedness department and general task force committee, and at a kebele level early warning and task force committees undertake disaster preparedness and prevention through regular assessment and dissemination of information by using formal communication such as report, mass media, letters, telecommunication and informal communication through the pastoralists traditional institution. For example, Oromia disaster prevention, preparedness and food security commission office disseminates information on metrological, hydrological and agricultural on monthly bases for each woreda of Oromia region. It also undertakes nutritional surveillance, livestock and feed early warning systems. In addition indigenous early warning systems that are based on indigenous knowledge and resource management system are used at community level. But the effectiveness is low in reducing the drought risk in pastoral areas due to lack of integrated early warning management among the stakeholders (author personal experience, 2008). For example in the 2008 severe drought, Gudji and Borana pastoralists loss 100,000 livestock (FAO, 2008) and also through this study it is identified that both village have lost 5934 livestock by 2002 and 2008 drought and its related effects.

The focus group participant reflects that as there is improvement in response that is given by government to save lives and livelihoods from the effects of drought. Even though, it is some extent on the increasing trend in undertaking early warning and drought cycle management, in the past, response from the government is delaying and resulted in loss of pastoralists' livelihood base. They also said that karrayyu pastoralists are continuously affected due to cattle raiding and conflicts that were caused by Afar but still today responses taken by all body at different level was/is low. They also claimed that starting from the 2002 karrayyu pastoralists continuously lost livestock by unexpected drought that is occurring every year and also pastoralists subjected to

sale livestock in low prices to illegal traders due to the lack of appropriate intervention to settle and facilitate market information before the onset of drought. Through this study 75 % of the household responded that lack of integrated early warning and drought cycle management is among the factors that challenging their responses to drought .

Conflict management and resolution

Conflicts are among the factors that are highly challenging the pastoralists of the study area to undertake responses to drought. At present, were resource shrinkage and degradation is at an alarming rate drought and conflicts are inseparable component. To overcome this situation governments established accountable and responsible bodies starting from the Federal up to kebele level that follow up, organize and settle any conflict that is caused between inter and intra ethnic group in order to minimize risk that affects the livelihood of the community. Although ultimate and sustainable solution towards conflict resolution that resort to long lasting conflict management (peace building) between Karrayu and Afar and Karrayu and Argoba is not obtained still to day the effort of ministry of federal affairs, administration and police at different level to settle the conflict through community conflict management awareness, capacity building were admirable (WFAEDO, 2009).

5.5.2.2 NGO Responses

Non-governmental organizations are important development partners in the country (Aklilu and A lebachew). NGOs intervening in various direct and indirect ways in regard with drought risk reduction. Direct forms include provision of food and feed aid to save lives and livelihoods sources, especially, livestock. Indirect form is in areas of risk management activities including developing an effective early warning, improving infrastructure, to increase off-take and increasing asset diversification mechanisms (Somer, 1988). Drought is a natural recurring part of climate of Fantale woreda. But until fairly recently, caused relatively few problems, pastoralists know traditionally how to deal with drought. However, in the present day the increase in severity and frequency of drought coupled with other man made factors decline the inherent response capacity of pastoralists to drought. Hence, the intervention of NGOs in these areas through emergency aid, early warning and livelihood asset development has a value in drought risk reduction. However, the intervention of NGOs in the study area is very low. In the present day only two NGOs such as GTF (Gudina Tumsa Foundation) and CCF (Christian children fund)

have been undertaking development activities in the area. GTF is a local nongovernmental development organization conducting livelihood asset development, and emergency aid in the study area since 1977. GTF undertake disaster risk reduction activities such as natural resource conservation and emergency aid to save the loss of livestock by drought through feed and water rationing; and also the water harvesting implemented by the community through the coordination and the support of the project under village level. The informants explained the usefulness and the plausibility of the mentioned activities by the organization.

Early warning and emergency aid is also major component of the GTF development project. Through its provision of early warning information the project undertake a well coordinated disaster preparedness and prevention activities such as harvesting and storing of pasture /grasses /to mitigate the effects of drought. According to the data from the woreda and economic development office, GTF has constructed 8 pasture storage, 20 cisterns, 10 boreholes, and also established 4 forest nursery sites in the woreda.

Regarding education GTF is the only organization contributing a lot in the expansion of both infrastructure and awareness creation prior to government in the study area. Informants indicate that there was no any educational center (primary or secondary) in the rural areas of the woreda before 1977. Both Derg and Haile Sellasi had not made any effort to expand education in the rural areas of the woreda. But GTF established the first of its – type mobile and permanent school starting from the 1977 in the remotest rural areas of the Karrayu. According to data obtained from the WFAEDO, GTF has constructed 6 primary school (1-4), 3 junior secondary school (1-8), 1 high school (9-10), and 1 preparatory school in the woreda. In addition GTF have projects on livelihood diversification such as a petty trade, credit and expansion of infrastructure. CCF also has undertaking expansion of infrastructure in the woreda. CCF is established 3 kg school, and 2 primary school in the woreda and also have project on capacity building. However, Communities were not acknowledged the intervention of CCF by saying that they provide attention to town dwellers.

CHAPTER SIX

6. Conclusion and Recommendation

This chapter presents conclusion of the study undertaken on the patterns of drought and community responses in Yaya and Dire villages of Fentale pastoral woreda of Oromia region. Furthermore, important future directions that will help full for the reduction of adverse effects of the drought on the lives and livelihood of the study area pastoralists' are forwarded.

6.1 Conclusion

Drought is the most inhibiting factors in Fentale Pastoral Woreda of Oromia Region. In the present day, a pattern of drought in the Fentale pastoral woreda is fluctuated from its normal situation. Drought cycle is shortened, severity of drought increased, and length of drought month in a year is increasing from time to time. Average annual temperature is increased in an alarming rate with great variation in monthly and annual average temperature. Rainfall is low, sporadic and variable. Intensity of rainfall is highly increased and duration of rain fall in the study area is decreasing in an alarming rate.

Increasing in frequency and severity of drought coupled with other man made factors have caused chronic pasture and water scarcity in the Yaya and Dire Redie villages of Karrayu community in the present day. In addition late on set and early cessation of rainfall for a subsequent season at the critical stage of grass growing has been decreasing the reproduction process and seed formation of the pasture and has resulted in extinction of palatable pasture species from the rangelands. Hence, when compared with the last 20 years the current livestock holding of Karrayu pastoralists' have been extremely declining due to drought and its related effects. Due to double edged swords of drought effects - which is death of livestock by drought and negative terms of trade; household livestock holding of study area has extremely declined in the present day. Declining in livestock holding is more in pastoral village (Yaya village) than agro-pastoral village. Increase in severity and frequency of drought and its related adverse effects have also declining livestock body condition, make livestock susceptible to disease and have resulted in reduction of production, productivity, and reproduction rate of livestock in the Yaya and Dire Redie villages of Karrayu pastoral woreda in the present day. In the present day, adverse effects of drought on the pastoralists livelihood is high; and required recovery period is long than

in the past in study area. These cumulative effects of drought have caused chronic food insecurity in the Yaya and Dire Redie villages of Fentale woreda of Oromia.

Due to these cumulative drought and related adverse effects pastoral mode of live of Karrayu pastoralists are plummeted in continuous fluxes. As a response to drought and food insecurity, in the present day, Karrayu pastoralists' have undertaking a set of pastoral and non pastoral activities to mitigate their livelihoods and to spread adverse effects of present day droughts. Responses of the households' are categorized at different stages and individual households are occupied in different types of the pastoral and non pastoral activities in which the wealth of the individuals coupled with external responses are a decisive factor for the engagement of the households in any one /more/ of the type of the livelihood sources.

In the present day, individual household of the study areas are found at different stages of responses. Very few aged and some rich pastoralists are limited themselves to the first stage (only pastoral activities) and modifying their extent of responses through undertaking only pastoral activities especially through giving due emphasis to herd diversification and mobility. But majority of the study area pastoralists have affianced in pastoral and non pastoral activities as a means of response mechanisms to the drought risk reduction and to diversify their livelihood sources. There were some Karrayu pastoralists who were reached the asset disposal and destitute stage. Karrayu pastoralists who have reached these stages are those who lost their livestock by both drought and selling for exchange of the grains and /or those who could not able to undertake appropriate responses to drought due to their livestock holding is becoming below threshold level. Rising temperatures, decreasing rainfalls, and longer and more frequent droughts increase pressure on pastoral resources leading to a rise in destitution among pastoral households in the Dhega Hedu and Gelcha Kebeles of Fentale woreda.

In general, in the present day, an extent of responses towards mobility and herd diversification is higher by the pastoral village than an agro-pastoral village. Even though, in the present day, an extent of pastoral village towards non pastoral activity is increasing, their extent of responses is lower when compared with the agro-pastoral village. Factors challenging response of pastoralists to drought in the study area are complex and many, deep rooted and multidimensional which includes both natural and man made factors. Adverse Effects of development projects, natural resource degradation, invasion of rangelands by the unpalatable tree species, effects of the lake

Beseka, disease and pests, rainfall scarcity, household characteristics, poor social and economic infrastructure and conflicts are among the factors that are seriously challenging responses that are undertaken by the Karrayu pastoralists' in order to spread the adverse effects of the recent severe drought that is aggravated by the climate change. In the present day, responses by external bodies such as governments and non-governmental organization, especially, in the areas of livelihood diversification and emergency aid are in some extent at a pace of progress. However, great emphasis is still given by external bodies to blue print planning development intervention (sedentary agriculture) which is risk and difficult task and its sustainability is under question in this harsh to live environment.

6.2 Recommendations

A finding derived from this study indicated that Karrayu pastoralists have been victims of drought and related adverse effects. Especially, in the present day drought cycle is shortened and the severity of drought on lives and livelihoods of pastoralists' is extremely increased bizarrely due to Global climate change and various man made factors. Hence, Contextual understanding of patterns of drought and identifying of various response mechanisms relevant in mitigating droughts, simultaneously working towards the betterment of pastoralists are the fundamental tasks that concerned stakeholders should take in to consideration. In vein of this the researcher believes that the following points/ areas/ are the decisive factors in spreading drought risks that is aggravated due to natural and manmade factors in the study area.

- **Designing Well Integrated and area specific Early Warning system:** Contextual Understanding of the patterns of recent severe drought should be the prerequisite task for any development intervention that is designed in promoting livelihoods of the area. Since monitoring of rain fall pattern is a useful indicator of early warning of drought, continuous forecasting and monitoring of climatic condition should be the prior issue that should be taken in to attention through using both indigenous knowledge and scientific methods; and disseminating of timely information to reduce the adverse effects of drought on the Karrayu pastoralists' livelihood. In this case, climate foresight must be integrated in planning for pastoralists' development as an early warning system and as a means of perceiving timely stress and to design early appropriate intervention. In line with this better awareness of how to access and use climate projections is required at

different levels of planning and implementation to mitigate the pastoralists' livelihood from the adverse effects of the recent severe drought and to develop local level adaptation.

- **Identifying and Strengthening appropriate response mechanisms to reduce adverse effects of recent severe drought that is aggravated by climate change:** Identifying more viable and productive pastoral and non pastoral activities that is well suited to the agro-ecological condition of the area is the decisive factors to reduce vulnerability of the pastoral households to drought. Mobility and herd diversifications are among the pastoral activities that requires due attention to minimize the adverse effects of drought on pastoral households. In addition, perseverance have to be made to make use of unexploited local wealth potentials of non pastoral activities such as agriculture (irrigation and rain fed agriculture) trade, micro enterprise, tourism as a development strategies in responses that are undertaken to drought. In this case identification and characterization of the distribution and composition of the livestock resources among the wealth group is mandatory to design appropriate and plausible intervention that is based on the household wealth characteristics. Traditional rangeland management and drought risk spreading strategies should strengthened, and go along with scientific rangeland and the drought cycle managements. Identification of the potential and degraded rangelands, species composition, productivity, status and type of management intervention to be embarked on is advisable. In this case, since the indigenous pasture on the rangelands is the primary feed source for livestock of the pastoralists, giving attention is needed for its improvement by applying rehabilitation intervention: dry season reserve areas should be better protected, unwanted plant species should be better controlled and the management and utilization of the feed source should be improved. Furthermore, natural and social science research institution should give due attention and priority to find drought tolerant and drought escaping forage, livestock and crop variety to strengthen pastoralists' adaptation to recent severe drought that is aggravated by climate change. In general, it is better to promote holistic development approach that comprise both pastoral and non pastoral activity to undertake sustainable responses to drought instead of only giving blue print development approach (sedentary agriculture) as a final option to adverse effects of drought.

- **Identifying factors that are challenging responses undertaken to drought by pastoralists:** It is better to identify natural and man made factors that are challenging response mechanisms of pastoralists to drought. In this case, designing holistic and long lasting strategies are fundamental to tackle the determinant factors in sustainable basis through sustainable pastoral livelihood approach. It is better, to put together well integrated intervention programme and strategies among the stakeholders (GOs, NGOs, UN agencies, civil societies) in order to tone down the many-sided ecological erosion that have been resulted in extinction of forage varieties and degradation of the natural resources that are seriously challenging the responses that are undertaken by the Karrayu pastoralists' to the present day severe drought. To this end policies of different sectors need to focus on specific demands of pastoral people and to give attentions to the local reserve endowments (resource) and household wealth differentiations. In addition, as part of the rangeland development endeavours, there is a need to design a sound full conflict resolution that floor the way towards reopening the closed rangeland resource due to conflict hazards, commercial agriculture and conservation parks. Hence, concerned bodies should mediate and design sustainable strategies through which development intervention not poses challenges on livelihood of the communities and through which it services local communities in reasonable way.
- **Improving social and economic service provision:** In the present day, the basic social and economic service provision and infrastructure development such as education, health, roads, market, water, credit services are poorly developed in the Dhega Hedu and Gelcha kebeles of the Fentale Woreda. Therefore, it is better t give due attention on the expansion of basic social and economic infrastructure development and provision of service with the aim: to connect marginalized pastoral families to the regional and national socio-economic development opportunities, to endorse pastoralists to take on appropriate response mechanisms to severe drought (climate change) and to build pastoralists asset base that constitute natural, physical, financial, human, and social capital.

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Appendix I Ethiopian Drought year

Year	Affected Areas	Severity
1895-96	Ethiopia	Loss of livestock and human lives
1899-1900	Ethiopia	Drought reduced from levels of lake Rudolf and low Nile floods
1913-14	Northern Ethiopia	Lowest Nile floods since 1695: grain price raised thirty-fold
1920-22	Ethiopia	Moderate drought as in 1985-85
1932-34	Ethiopia	Deduced from low level of water in Lake Rudolf in Kenya
1953	Tigray and Wollo	Severity unrecorded
1957-58	Tigray and Wollo	Rain failure in 1957, locust and epidemic in 1958
1962-63	Western Ethiopia	Very Severe
1964-66	Tigray and Wollo	Undocumented; said to have been worse than in 1973/74
1969	Eritrea	Estimated 1.7 million suffered food shortage
1971-75	Ethiopia	Sequences of rain failure, estimated 250,000 dead 50% of livestock lost in Tigray and Wollo.
1978-79	Southern Ethiopia	Failure of belg rain
1982	Northern Ethiopia	Late meher rains
1984-85	Ethiopia	Sequential rain failure; 8 million people affected, estimated 1 million dead, many livestock lost
1987-88	Ethiopia	Drought of unrecorded severity in peripheral regions
1990-92	Northern, eastern and south-eastern Ethiopia	Rain failure and regional conflicts. Estimated 4 million people suffered from food shortage.
1995-96	Southern Oromiya and Afar	Cattle death
1999-2000	Afar, Somali, South Oromiya, Tigray and Amhara	Cattle death and severe water shortage
2002/03	Ethiopia	

Source: -Web. P. et al., Famine in Ethiopia: Policy Implications of Crop Failure at National and Household Levels, 1992 (in Melakou A. et al., 1997) and Various DPPC reports

Appendix II FGD, participants

SR. no	Name	PA	Sex
1	Haji Qasaro Jilo	Gelcha	M
2	Boruu Saroo Jimmaa	Gelcha	M
3	Baati Boruu Dadhi	Gelcha	M
4	Qunbi urgessa Urji	Gelcha	M
5	Hawaas Bulga Shora	Gelcha	M
6	Umar Roba Hawas	Gelcha	M
7	Halkoo Suuraa Jirruu	Gelcha	F
8	Ayantu Jiraan Dura	Gelcha	F
9	Ashaa Bakkee Kaleessa	Gelcha	F
10	Barite Rare Bekalcha	Gelcha	F
11	Tukuli Jilo Awasa	Gelcha	F
12	Amina Yaya Umar	Gelcha	F
13	Hasaan Roba Mustefa	Dhaga Heddu	M
14	Elemo Wada Wako	Dhaga Heddu	M
15	Bulaa Hawas Duleha	Dhaga Heddu	M
16	Hasan Roba Wadayi	Dhaga Heddu	M
17	Fate Abdi	Dhaga Heddu	F
18	Binte Tukuli	Dhaga Heddu	F
19	Gale Gisa Jilo	Dhaga Heddu	F
20	Hawe Shukuri Fantal	Dhaga Heddu	F

Appendix IV. Research tools

1. General

- 1. Enumerators name _____
- 2. Supervisor name _____
- 3. Date of interview _____
- 4. Signature _____
- 5. name of PA _____
- 6. Name of village _____

2. Demographic characteristics

2.1. Household's demographic information

Name	Sex	Age	Relationship to HH(05)	Marital status(06)	Educational status(07)	Religion (08)	Ethnicity (09)	Clan
codes			1. Household head 2. Wife/husband 3. Son/daughter 4. Parent 5. Grand child 6. Brother/sister 7. Not related 8. Other	1. Single 2. Married 3. Divorced 4. Widowhood	1. Illiterate 2. Read and write 3. Grade 1-6 4. Grade 7-8 5. Grade 9 10 th complete and above	1.Muslim 2.Christian 3.Waqefata 4.Others	1.Oromo 2.Afar 3.Amhara 4. Argoba	

2.2. What is your livelihood base (What is your mode of life) ?

- ☐ Pastoralism
- ☐ Agro - pastoralism
- ☐ Sedentary agro – pastoralism

3. Patterns of drought in the study area

1.1 What was/ is the pattern of drought that is aggravated due to climate change in your village? Fill the table

Description	codes	Before 10 years	Now (in this decades)
- Cycle of drought year (01)	1. Short, 2.medium. 3. long		
- Length of drought month in a year (01)	1. Short, 2.medium. 3. long		
- Severity of drought or hotness (02)	1.low, 2.moderate,3..high		
- Length of rainy month in a year (01)	1. Short, 2.medium. 3. long		
- Intensity of rain fall (01)	1. Short, 2.medium. 3. long		
- Wind pressure (02)	1.low, 2.moderate,3.high		

4. Adverse effects of drought on the pastoralists' livelihood

4.1. Which drought years do you remember? List the year

4.2. What has happened to your family and livestock during each of this drought period? Fill the table

What was/is the Effect of drought on your livelihood sources?	Before 10/20/30 years			Now		
	02	03	04	05	06	07
	Event	severity	Recovery period	events	severity	Recovery period
- Decline of milk per TLU						
- Decline of livestock physical condition						
-Cause Livestock disease and pest out break						
- Death of livestock						
- Decline of herd size						
- Decrease in price of TLU						
- Food shortage /starvation						
- Increase in cereal price						
- Decline of internal support						
- Decrease in livestock breeding rate						
- Decrease quality of livestock products						
- Cause Human disease break out						
- Cause conflict over resources						
code	1.yes 2.no	1. low, 2.moderate, 3.high	1. short, 2. medium, 3. long 4. no	1.yes 2.no	1. low, 2.moderate 3. high	1. short, 2..medium 3. long 4. no

4.3. What was the reason for the decline of the livestock price in the last drought period?

Multiple answers is possible

- ☐ Majority of herders delivered their stock to market in fear of death due to drought
- ☐ Due to rise in cereal price pastoralists subjected to sale more livestock
- ☐ Lack of intervention in settling market during drought
- ☐ Traders knowingly fall the price of livestock during drought
- ☐ Livestock body condition is declined due to lack of pasture and water
- ☐ Livestock body condition is declined due to disease

4.4. Based on the Q No 4.2 if you did lose your livestock during the last drought, what was their numbers? Fill the table

Type of livestock	Number of livestock before 2002 drought	Number died by 2002 and 2008 drought	Current livestock size
- Cattle			
- Sheep			
- Goat			
- Camel			
- Other			

4.5. What is the trend of amount of milk per livestock? Fill the table

Type of livestock	Amount of milk/day/ livestock before 10 years	Amount of milk/day/ livestock during the last drought	Current amount of milk/day/ livestock
- Cattle			
- Goat			
- Camel			

TLU-Tropical Livestock unit

4.6. Did human life lost during the last drought from your family? ☐Yes ☐No

4.7. If yes, fill the table

Type of human life lost	Number of life lost
Child	
Elder	
wife	
Husband	
Daughter	
Son	
Others	

2. Responses that are under taken by pastoralists to drought

5.1. What is/was your response mechanisms and extent of responses to mitigate the effects of drought on your livelihood (livestock) that is aggravated due to climate change? Fill the table code for 02 and 03 = Extent of responses (1. no, 2. low, 3 medium, 4. high)

Which type of responses you have undertaken?	Before 10 years due to conventional drought	Now due to climate change (As Modified responses to drought aggravated by CC)
	02	03
1. Pastoral activities		
- Mobility		
- Herd splitting		
- Herd diversification		
- Assistance from relatives		
- Sale of small livestock		
- Sale of livestock products		
- Sale of large stocks		
- Use of inter household transfer and support		
2. Non Pastoral activities		
- Rain fed agriculture		
- Irrigation agriculture		
- Sale of fuel wood and charcoal		
- Casual labor		
- Use of wild fruits		
- Trade		
- Reduction of consumption		
3. Total asset disposal		
- Livestock		
- Household tools		
- Credit		
Code for Extent of responses	1. No 2. low 3 medium 4. high	1. No 2. Low 3 medium 4. high

5.2. Based on the above table if your pastoral activities are in a decreasing trend, what is the reason?

- ☐ Policy curtailed mobility
- ☐ Shrinkage of rangeland due to Conservation Park, commercial agriculture and
Invasions by unpalatable tree species
- ☐ Lack of livestock due to drought that is aggravated by climate change
- Other, specify _____

5.3. Based on the question 5.1 (table) If you did not undertake crop farming before 10/20/30 years what was the reason?

- ☐ Low livestock death due to drought
- ☐ I had enough income from livestock
- ☐ Pasture and water were available to hold large number of livestock
- ☐ Low population pressure
- Other, specify _____

5.4. If you under take your farm through irrigation, who constructed the irrigation

- Canal? ☐ Private by household (independently) ☐ Community
☐ Government ☐ NGO

5.5. When did the construction of the main and sub-canal of irrigation completed? _____

5.6. Here before, for how many years did you undertake crop farming through irrigation? _____

5.7 What kind of change you have obtained through using irrigation agriculture?

- ☐ Secured in food ☐ Starting petty trade
- ☐ Building residential house ☐ Starting medium business

5.8. What was/is the composition of your herds? Fill the table (write 1 if few and 2 if large)

Type of livestock	Before 10 years	in this decades (now)
	02	03
- Cattle		
- sheep		
- Goat		
- Camel		
- Poultry		
- Beekeeping		
- Others		

5.9. Which of the following of your livestock are more tolerant to drought? Rank on the table in a decreasing order

Type of livestock	Rank						
	01	02	03	04	05	06	07
- Cattle							
- Sheep							
- Goat							
- Camel							
- Poultry							
- Beekeeping							
- Others							

5.10. Which of the following livestock recovered more before the occurrence of the other wave of drought after hit by previous drought? Rank on the table in a decreasing order

Type of livestock	Rank						
	01	02	03	04	05	06	07
- Cattle							
- Sheep							
- Goat							
- Camel							
- Poultry							
- Beekeeping							
- Others							

5.11. Currently why you have diversified your herds?

- ☐ Camel and goat are more tolerant to drought than sheep and cattle
- ☐ Small stocks are easily recovered after drought
- ☐ Other, specify _____

6. Factors Challenging pastoralists' response to drought and available opportunities
(Objective 4)

6.1. What is the current trend of rangeland degradation in your area? Fill the table (write 1 if it is increasing and 2 if it is in a decreasing trend in column 02)

	02
- Drying up of water points	
- Shortage of pasture	
- Invasion of rangelands by unpalatable tree species	
- Water and wind erosion	
- Shrinkage and degradation of rangelands due to different man made factors	
Code for the trends	1. Increasing 2. Decreasing

6.2. What was/is the source of water and fodder for your household and livestock? Fill the table

What was/is the Source of water and fodder?	02	If yes, distance from the home (03)	Availability (04)	
			Before 10 years	Now
1. Water				
- River				
- Boreholes				
- Eelas				
- Ponds				
- Pipe water				
- Irrigation water				
- Springs				
2. Pasture/fodder				
- Private area closure				
- Communal grazing land				
- Crop residue				
Codes	1. Yes 2. no	1. <3km 2. 4-9km 3. >10 km	1.scarce, 2.moderate 3.abundant	1.scarce, 2.moderate 3.abundant

Code for 02: 1.yes, 2.no; code for 03: 1. <3km, 2. 4-9km, 3. >10 km and code for 04=1.scarce, 2.moderate 3.abundant

6.3. What is the management practice that you have undertaken to minimize the degradation of your private closure area, farmlands; and communal grazing and water points? Fill the table below (write 1 if yes, and write 2 if no in 02 and 03 column)

Which management practice you have undertaken?	Before 10/20/30 years	In this decades (now)
	(02)	(03)
-Reseeding of grass species		
- Terracing		
- Planting seedlings		
- Water harvesting		
- Management of water points and Controlled watering		
- Cut and carry system of grasses		
- Agro-forestry practice		
- Prescribed Rangeland burning		
- Controlled grazing system (dry and wet season grazing location)		
- Resting		
- Destalking and herd splitting		
codes	1. Yes 2. no	1. yes 2. no

6.4. What are the exogenous and endogenous factors that are challenging your responses to drought? Fill the table (write 1 if yes and write 2 if no)

	Yes	No
- Weakening of traditional institution		
- Lack of integrated early warning and drought cycle management		
- Weak relationship with formal institutions		
- Conflicts		
- Cattle raiding		
codes	1 .yes 2 no	1.yes 2.no

6.5. What were the type and number of livestock you have lost in the last cattle raiding and conflict? (Fill table below)

Type of cattle	Number of livestock lost due to conflict	Number of livestock lost due to cattle raiding
- Cattle		
- Sheep		
- Goat		
- Camel		
- Others		

6.6. Did you get food aid in the last 12 months? ☐ Yes ☐ No

6.7. If yes, fill the table

Type of aid	Quantity	Value in birr	Remark

6.8. Did you get emergency aid for your livestock in the last drought period?

☐ Yes ☐ No

6.9. If yes, fill the table

Type of aid/intervention	Quantity	Value in birr	Name of Donor organization (Gos or NGOs)

6.10. Did you get any support from the intervention in the last three years? Fill the table

Type of aid/intervention	Quantity	Value in birr	Donor organization

6.11. Are there any family members/relatives who have been living out of the household and send remittance to the household? ☐ Yes ☐ No

6.12. If yes, fill the following table

S.N	Name	Sex	Education status	Reason for migration (10)	Present work at destination	Annual income	Assistance send to family annually

Code for 10: 1. Employment 2. Education purpose 3. Livestock losses
4. Conflict 5. Drought 6. Marriage

6.13. What is the availability and accessibility of the social and economic service in your village? fill the table below

Type of service	Amount in number	Distance from the home/village	Remark
1.Educational service			
- KG			
- 1-4			
- 5-8			
- 9-10			
- 11-12			
2 Health service center			
- Health post			
- Health station			
- Vet. service			
- Others			
3. Water service			
- For livestock			
- For human consumption			
4. Market center			
5. Road	(05)		

Code for 05: 1.dry season, 2.wet season

7. Dimension of pastoral mode of life of Fentale woreda (Objective 5)

7.1. Currently, do you practicing pastoralism only? ☐ Yes ☐ No

7.2. If no, what are the sources of your income? Multiple answers are possible

- ☐ Sale of livestock ☐ Crop farming
☐ Sale of livestock product ☐ Off-farm activities
☐ Salary ☐ Trade

Other, specify _____

7.3. What was your annual income from livestock in the last year?

Description of items	Annual income	Remark
Sales of livestock		
Sales of milk and milk products		
Sales of hides and skin		
Others		
Total		

7.4. What was your annual income from non-livestock activities in the last year? Fill this table

Type of non pastoral activities (01)	Cultivated area in hectare (02)	Yield in quintal		Value in birr (05)
		Per hectare (03)	Total (04)	
1. Rain fed agriculture				
- Cereal				
- Vegetables				
- Fruits				
- Others				
2. Irrigation agriculture				
- Cereal				
- Vegetables				
- Fruit				
- Others				
Total				
3. Trade				
4. Sale of charcoal and fuel wood				
5. Causal labor				

Notice: For type of non-pastoral activities 1 and 2 fill the whole column. For activities 3, 4, and 5 fill the 5th column only.

7.5. Household asset information

Description	Before 10 years	In this decades (now)	Remark
	Quantity	Quantity	
1. Livestock			
- Camel			
- Cattle			
- Goat			
- Sheep			
- Donkey			
- Poultry			
2. Land			
- Pasture land			
- Irrigable land			
- Rain fed farmland			

7.6. What are your staple foods? (Multiple answers are possible)

- ☐ Milk and other livestock products ☐ sorghum
☐ Maize ☐ sorghum
☐ Rice ☐ wheat flour
 other (specify) _____

7.7. Do you tell us the consumption of each one of the following food and non food items in your families for the last one year?

Food items	Unit	Quantity	Value in birr
Sorghum			
Rice			
Maize			
Wheat			
Milk			
Meat			
Oil			
Sugar			
Salt			
Cloth			
Medicine			
Spices			
Education fees			
Vet services			
Purchase of animals			
Social obligation			
Chat and tobacco			
Household utensils			
Others			
Totals			

7.8. If yes, which months was the food shortage more sever? _____

7.9. What was the cause for the food shortage (deficit) by the time?

- ☐Death of livestock due to drought
- ☐Scarcity of pasture and water
- ☐Decline of livestock price
- ☐Conflict
- ☐Livestock disease break out
- Other (specify) _____

7.10. What responses did you undertake to cope with the situation (with the deficit)?

- ☐Purchase of more food on cash
- ☐Sale of more animals
- ☐Borrow money and grain from friends'
- ☐Income from non-pastoral activities
- ☐Food aids
- ☐Gift/remittance
- ☐Migration to other places.

Guiding question for qualitative data collection

I KIIs and FGDs

1. Household livestock size
 - 1.1 What was the productivity and size of livestock population in your village 10 years ago?
 - 1.2 What is the current productivity and number of livestock population in your village?
 - 1.3 If they have been in decreasing trend, what are the reasons for the trend?
 2. Natural resources
 - 2.1 What was the availability and condition of natural resources in your village 10 years ago?
 - 2.2 What is the trend now?
 - 2.3 What are the reasons for decreasing or increasing trend?
 3. Drought
 - 3.1 What was the pattern of drought before 10 years?
 - 3.2 What is the trend now?
 - 3.3 If increasing, what are its effects on your livelihood?
 4. Responses to drought
 - 4.1 What was the prevalence of non-livestock activities in your village? Before 10?
 - 4.2 What is the trend now?
 - 4.3 What are the reasons for increasing or decreasing trend?
 5. Challenges and available opportunities in undertaking responses to drought
 - 5.1 What are the endogenous and exogenous factors challenging response of pastoralists to drought?
 - 5.2 What are the available opportunities in your village/kebele in undertaking appropriate responses for mitigating the effects of drought on your livelihood?
 6. Social and economic infrastructure
 - 6.1 What was the availability and condition of infrastructure in your village 10 years ago?
 - 6.2 What are the trends now?
 - 6.3 What are the reasons for decreasing or increasing?
 7. Social relation
 - 7.1 What was the availability and strengthen of social relation in your village 10 years ago and now?
 - 7.2 What is the trend now?
- 3 What are the major formal and informal institutions in your village/kebele?
 - 4 What are the roles of these institutions in your village/kebele?
- Informal Institutions
- 5 What are the major informal institutions in your village/kebele?
 - 6 What are their roles in key decisions areas?

II Case Study household interview

Household economic asset

1. What was the productivity and number of your livestock population in your village 10 years ago?
 2. What is the current productivity and number of livestock population in your village?
 3. If they have been in a decreasing trend, what are the reasons for that trend?
- Non livestock activity trend
4. What was the prevalence of non-livestock activities in your village 10 years ago?
 5. What is the trend now?
 6. What are the reasons for increasing or decreasing trend?

Element Monthly Max. Temp. in °C
Region SHOA
station METEHARA

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1984	0	0	0	0	0	0	0	0	0	33.8	32.8	30.6
1985	32.2	31.7	35.5	33.5	34.5	36.7	32.7	31.4	33.7	33.9	32.6	30.8
1986	30.9	33.6	34.4	34.4	36.5	34.9	32.8	33.6	34.5	33.9	33.1	31.1
1987	30.3	33.6	33.6	33.6	33.7	36.9	36.4	33.3	35.7	34.7	33.1	32.1
1988	31.0	33.8	35.5	35.5	37.3	37.1	32.2	31.7	32.7	33.2	31.7	30.3
1989	29.7	30.7	33.4	31.1	35.8	36.0	32.6	33.2	33.7	34.2	32.4	29.9
1990	31.2	29.6	30.9	32.7	37.0	37.7	32.7	32.7	33.6	34.1	32.7	30.8
1991	32.6	32.2	34.6	34.1	35.0	36.7	32.3	31.3	33.9	33.8	31.8	31.0
1992	30.4	29.8	35.1	35.3	35.9	36.6	32.8	30.9	32.3	32.7	31.8	315.0
1993	30.2	28.9	34.9	33.5	33.6	36.8	33.1	33.1	34.2	33.9	32.7	31.4
1994	31.4	33.0	35.3	36.5	36.3	36.3	32.1	31.7	32.3	33.5	31.0	30.1
1995	31.1	33.4	32.4	34.8	36.9	37.7	33.2	32.5	33.5	34.3	33.0	32.5
1996	31.6	34.2	34.4	34.4	34.3	34.7	32.3	32.4	34.1	34.3	31.9	31.1
1997	31.3	32.1	35.3	34.1	36.8	36.3	33.1	33.3	36.0	31.6	30.3	30.4
1998	30.1	32.9	33.9	36.9	37.2	38.1	34.3	31.5	33.8	32.9	32.3	31.0
1999	32.0	34.8	32.8	36.3	37.2	36.8	31.9	32.0	33.7	31.9	31.3	30.4
2000	31.8	33.2	35.1	35.7	36.8	37.3	33.2	31.5	33.7	32.7	32.0	30.9
2001	30.1	32.8	33.7	35.9	37.8	36.4	33.0	31.3	34.9	34.8	32.7	31.7
2002	30.9	33.9	34.5	36.3	38.3	37.8	36.6	33.6	35.4	35.3	33.5	31.4
2003	31.3	34.8	35.6	35.8	38.1	36.8	32.0	31.6	32.6	35.2	33.1	30.9
2004	32.3	32.4	34.1	33.4	37.8	36.9	33.0	33.1	34.7	33.4	32.5	31.2
2005	31.6	35.0	33.7	35.8	34.5	36.5	32.2	33.4	35.0	34.9	33.2	31.7
2006	32.7	34.0	34.3	34.9	37.3	37.9	33.7	31.7	34.4	34.4	32.5	29.9
2007	31.1	34.0	35.3	34.9	38.1	36.6	33.6	31.0	33.0	33.9	31.9	31.0
2008	32.4	32.0	36.1	36.0	36.0	36.1	32.8	32.0	34.7	34.2	30.2	31.0
2009	31.2	34.0	36.5	36.1	38.0	38.7	34.8	0.0	0.0	0.0	0.0	0.0

Element Monthly Min. Temp. in °C
Region Shoa
station METEHARA

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1984	0	0	0	0	0	0	0	0	0	0	15.1	13.7
1985	12.8	13.9	18.0	18.7	18.4	20.8	18.4	17.8	18.0	15.5	13.3	12.4
1986	9.8	18.4	17.6	19.9	19.8	20.9	19.4	19.7	18.6	15.6	13.8	13.6
1987	13.6	15.0	19.3	17.2	18.7	22.9	22.2	20.3	20.2	17.8	12.7	13.6
1988	16.7	18.8	17.9	19.9	19.1	22.3	20.6	19.5	19.4	16.7	10.0	12.2
1989	13.1	15.9	17.8	18.7	16.0	19.7	19.9	19.2	19.0	15.2	14.5	18.0
1990	14.7	18.8	17.6	16.9	20.8	22.6	19.4	19.9	19.9	15.1	14.7	12.2
1991	16.4	18.2	19.5	18.7	19.2	21.7	20.4	19.8	19.5	15.7	12.8	13.6
1992	16.9	19.1	20.5	20.3	19.8	21.5	20.3	19.9	18.6	16.8	15.0	16.8
1993	13.4	16.3	15.5	19.7	19.4	21.9	20.3	20.3	20.6	18.3	14.3	12.4
1994	11.9	14.8	20.1	20.8	19.9	21.8	19.6	19.5	18.5	15.4	14.3	13.0
1995	x	17.4	18.6	19.7	19.8	21.1	21.2	20.0	19.0	17.0	13.2	17.1
1996	17.7	15.2	20.1	x	19.7	21.4	20.2	20.1	20.0	15.4	13.4	11.7
1997	16.0	12.8	19.1	19.5	19.5	20.6	20.1	20.4	20.1	18.7	18.6	14.4
1998	18.1	19.6	20.1	20.4	21.1	23.2	21.4	20.0	20.3	17.8	12.6	10.0
1999	14.1	14.5	18.9	18.7	19.5	21.1	18.9	19.2	19.6	17.6	12.6	12.1
2000	12.1	12.1	16.5	19.3	20.7	22.4	19.8	19.7	19.7	15.9	14.7	13.0
2001	13.4	14.8	18.9	18.2	21.0	22.3	20.0	20.1	18.6	17.9	13.9	14.3
2002	16.6	15.7	20.1	19.9	20.5	22.3	21.8	20.0	19.1	17.7	14.3	18.0
2003	16.0	17.1	19.2	20.5	19.2	21.2	20.4	19.6	20.0	16.3	16.0	14.3
2004	18.2	15.4	16.1	19.3	18.3	21.9	19.6	20.6	19.9	16.7	15.5	15.8
2005	15.4	15.6	19.3	18.6	20.2	21.7	20.3	20.0	20.8	16.2	14.5	10.5
2006	15.7	18.2	17.8	19.3	x	x	20.6	20.5	20.2	18.8	15.6	16.2
2007	16.7	17.9	17.3	19.3	21.8	22.4	20.7	19.6	20.3	15.6	14.7	10.5
2008	14.1	14.3	13.3	18.9	20.2	21.4	20.0	19.8	20.3	16.6	13.8	11.0
2009	13.5	16.0	17.9	19.4	19.4	21.7	20.9	0.0	0.0	0.0	0.0	0.0

Element Monthly Total Rainfall in mm

Region shoa

station metehara

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1984	x	x	x	x	x	x	x	x	x	0.0	0.0	2.0
1985	6.3	0.0	29.6	76.6	104.5	12.0	166.7	153.7	41.9	4.4	0.5	0.0
1986	0.0	41.6	43.2	25.9	13.0	51.8	64.3	67.1	36.5	4.0	0.0	7.0
1987	0.0	24.1	71.2	78.0	74.8	0.0	53.6	110.4	8.0	2.8	0.0	0.0
1988	13.6	29.6	11.3	23.7	7.8	11.3	156.5	136.1	104.3	18.0	0.0	11.9
1989	0.0	28.0	104.8	101.3	7.5	82.1	48.7	92.7	28.2	5.6	0.0	12.7
1990	0.5	220.8	58.1	62.9	1.8	0.9	146.4	76.9	82.4	2.1	0.0	0.0
1991	0.0	54.3	56.1	46.7	53.3	15.4	137.0	132.0	49.6	11.7	0.0	0.0
1992	25.8	50.3	0.0	75.8	16.8	62.4	90.0	157.6	62.2	49.6	5.7	2.3
1993	43.8	59.5	0.0	139.6	57.3	23.7	101.4	103.7	41.6	21.9	0.0	56.9
1994	0.0	0.0	6.5	21.4	55.4	38.6	248.4	131.6	39.6	0.1	12.7	1.9
1995	0.0	43.5	81.9	44.0	10.5	28.5	47.3	144.1	57.7	0.5	0.0	0.0
1996	27.6	0.0	97.3	35.1	80.5	26.5	205.1	100.5	52.6	1.6	7.5	0.0
1997	29.7	0.0	12.6	44.3	11.5	35.1	139.7	53.8	20.4	112.4	14.6	0.0
1998	0.8	18.1	76.6	34.2	14.9	4.7	78.2	135.6	54.0	78.0	0.0	0.0
1999	0.0	0.0	73.6	6.2	15.9	16.7	136.1	151.2	16.4	76.2	2.2	0.0
2000	0.0	0.0	1.8	20.7	36.9	29.6	135.9	152.7	46.8	47.3	11.9	9.4
2001	0.0	13.6	92.7	20.4	12.7	20.2	154.8	82.8	15.3	7.1	0.0	1.6
2002	2.6	0.0	73.3	19.3	9.3	10.2	43.0	80.8	16.8	0.0	0.0	21.2
2003	4.6	17.5	33.6	13.7	0.0	29.5	118.9	186.0	31.0	0.0	3.2	15.7
2004	35.1	3.2	80.6	142.4	0.0	21.2	85.3	123.9	39.3	15.9	4.5	0.0
2005	19.3	0.0	47.2	54.3	75.5	35.7	146.4	138.4	21.6	0.0	5.2	0.0
2006	0.9	29.3	33.9	33.4	10.0	26.8	142.1	65.0	22.8	37.5	0.8	65.1
2007	9.1	44.0	105.4	19.9	20.3	6.5	124.0	157.5	69.7	4.7	17.3	0.0
2008	0.4	0.0	0.0	26.2	62.2	12.4	197.0	95.9	15.3	49.1	58.3	0.0
2009	84.8	0.0	11.4	16.1	14.1	29.7	54.7	0.0	0.0	0.0	0.0	0.0

DECLARATION

I declared that “patterns of drought and community responses” in Fentale Pastoral Woreda of Oromia Region is my original work and has not been presented for any degree in any university and that all the sources used have been dully acknowledged.

Name: Abera Bekele

Signature: _____

Date:_____

This thesis has been submitted for examination with my approval as university advisor

Name: Dr. Aklilu Amsalu (Advisor)

Signature: _____

Date:_____