

ADDIS ABABA UNIVERSITY
COLLEGE OF DEVELOPMENT STUDIES
INSTITUTE OF RURAL DEVELOPMENT

**Determinants of the Livelihood Resilience of Rural
Households In The Face Of Flood Disasters in Ethiopia:
A Case Of Dembia Wereda, North Gondar Zone Of
Amhara National Regional State**

By
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Addis Ababa

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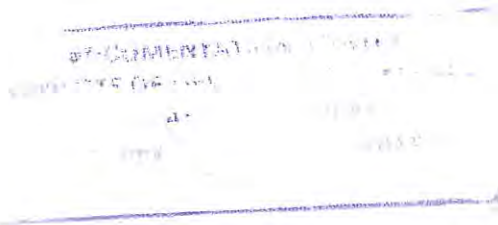
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Zone Of Amhara National Regional State**

**A thesis submitted to the School of Graduate Studies of
Addis Ababa University in partial fulfillment of the
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Studies in College of Development Studies**

By: Zerihun Berhane

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BY

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List of Acronyms

ANRS	Amhara National Regional State
ASCI	Amhara Saving and Credit Institution
AWD	Acute Watery Diarrhea
CBOs	Community Based Organizations
CSA	Central Statistical Agency
DAs	Development Agents
DFID	Department for International Development
DPPA	Disaster Prevention and Preparedness Agency
DPPC	Disaster Prevention and Preparedness Commission
DWARO	Dembia Woreda Agricultural and Rural Development Office
FAO	Food and Agricultural Organization
FGD	Focus Group Discussion
FSCDPO	Food Security Coordination and Disaster Prevention Office
IFRCS	International Federation of Red Cross and Crescent Societies
IFPRI	International Food Policy Research Institute
IISD	International Institute for Sustainable Development
IPCC	Intergovernmental Panel on Climate Change
ISDR	International Strategy for Disaster Reduction
NGOs	Non Governmental Organizations
PRA	Participatory Rural Appraisal
RRC	Relief and Rehabilitation Commission
SNNPR	South Nations, Nationalities and Peoples Region
SPSS	Statistical Package for Social Scientists
UNISDR	United Nations International Strategy for Disaster Reduction
UN-OCHA	United Nations Office for the Coordination of Humanitarian Affairs

Abstract

The recent trend of increasing incidents of floods in Ethiopia is disrupting the livelihoods of a significant proportion of the country's population. In view of this fact therefore, this study considers flooding as a major livelihood shock and attempts to assess the resilience of rural households, focusing mainly on the factors that shape their resilience, in the face of recurrent flooding.

The study was conducted in Dembia woreda of Amhara region as one of the flood-prone areas in the country. In assessing factors that determine the resilience of households in the face of flooding in the woreda, the study used the sustainable livelihood model as a conceptual framework.

The study relied on both quantitative and qualitative methods of data collection and analysis. The primary data were collected by using qualitative data gathering tools such as focus group discussions and key informant interviews. Accordingly, three FGDs were held with farmers purposively selected from two kebeles. Key informant interviews were done with woreda Agriculture and Rural development Officials, experts and DAs. With the view of supplementing the qualitative data, the study employed a questionnaire survey with 84 sampled heads of households selected from the two kebeles.

The findings of this study showed that flooding is the main livelihood problem in the study area which has been showing a marked change in its nature, becoming more frequent and severe in recent years. Most of the studied households were also found to be less resilient and more vulnerable to the effects of flooding. Access and use of livelihood resources such as size of farmlands, availability of farm oxen, credit as well as ability to draw help from social networks were found to be the most important factors that determine the resilience of studied households in the face of floods. Similarly, the coping strategies employed by households were found to be constrained mainly by the scale and impact of the recent floods and lack or shortage of basic infrastructural and social facilities. Besides, most of the traditional coping strategies employed by households failed to effectively help households offset the impacts of flooding.

Finally, the study suggests more focus on addressing the factors that expose people to flood disasters and shape their resilience, rather than focusing on short-term emergency responses which seems to be the norm in much of the flood affected areas in the country.

CHAPTER ONE

INTRODUCTION

1.1. Background

Rural livelihoods are often characterized as ‘complex’ and ‘dynamic’, as they involve risks and uncertainties, which tend to change through time and space as a result of the interplay among several factors. These risks and uncertainties derive from both natural and human activities and directly or indirectly affect the specific strategies that people employ at national, community or household levels to sustain their livelihoods (Marschke and Berkes, 2006; Blaikie *et al.*, 1994). In addition, the dynamism involved in the risks expose livelihoods to shocks and stresses that are beyond peoples’ control and form the ‘vulnerability context’ of their livelihood systems, which in turn determine the livelihood conditions of people, depending on their ability to withstand or recover from the ill effects of shocks and stresses, indicating their resilience (Blaikie *et al.*, 1994).

One source of external shocks and stresses to peoples’ livelihoods is the natural environment, upon which the majority of rural people in developing countries depend for their subsistence (Blaikie *et al.*, 1994). Such dependence on the natural resource base, makes people more vulnerable to the vagaries of nature. Thus, extreme natural events such as drought, pests, flooding, epidemics, earthquakes, etc ..., often turn into disasters and pose major livelihood risks to people. This is particularly evident in Sub Saharan Africa where poverty and food insecurity have long been associated with the onset of extreme natural events, such as droughts, that together with socio-economic and political factors, were noted to be easily transformed into major livelihood crisis such as famine (Belaineh, 2003; Salih, 2001).

Similarly, rural livelihoods in Ethiopia depend on the natural environment, as agriculture is the major economic activity for the majority of the population. This directly or indirectly exposes people to shocks and stresses. These shocks and stresses, while showing differences in their magnitude and effects, are mainly driven by climatic events. In this regard, drought has long been recognized as a major climatic hazard that affects

livelihoods, in terms of its scope and magnitude, often resulting in a sharp decline in food production, and associated problems of food insecurity, destitution as well as famine (e.g. Belaineh, 2003; DPPC, 1997; Tilahun, 1995). However, other natural disasters have also caused misery and destitution for rural livelihoods. In fact, historical records indicate that the “the great famine” or otherwise known as ‘kefu ken’ in the late 19th Century was mainly caused by livestock epidemics and the associated lack of draft power (Pankrust, 1985). Thus, the outbreak of human and animal diseases, crop pests, flooding, and to some extent, land slides have become regular and adverse natural hazards in some regions (DPPC, 1994).

Among the non-drought natural disasters in Ethiopia, flooding has been showing an increase in its frequency and severity, which seems parallel with the recent trends in increased floods on a global scale, which continue to pose a major threat to the livelihoods of the majority of the world’s poor. In this regard, some studies and reports by major international organizations such as, the International Federation of Red Cross and Red crescent Societies(IFRCS), and global insurance companies indicate that floods are the most frequent hazards that occur worldwide with increasing trend in occurrences and by far surpass the effects of other disasters in terms of the number of people killed and the amount of property destroyed (IFRCS, 2000; 2006; Munich Re, 1997).Other studies made by the Intergovernmental Panel on Climate Change (IPCC) also indicate the probability of severe and frequent floods in the future associated with global warming and related climate change (IPCC, 2001; 2007).

In this context therefore, it is possible to argue that flooding is and will continue to be a pronounced and emerging disaster agent in Ethiopia. This is particularly evident in areas where flooding has been showing changes in its frequency and magnitude from which large numbers of people have already suffered. In view of this, a report by the United Nations Office for the Coordination of Humanitarian Affairs (UN-OCHA) indicates that almost all regions in the country have experienced severe flooding in 2006, which affected 357,000 people resulted in the disruption of livelihoods forcing them to live on relief assistances (UN-OCHA, 2006). Similarly, the report states that seasonal flooding in

the country continued to affect 103,000 people in five regions, having long-term effects on their livelihoods by causing damages to crops, pasture lands and infrastructures. Moreover, both riverine and flash floods, associated with heavy rainfall on the highlands were reported to have increased the flood water area coverage. This in turn is expected to significantly raise the number of people that live in flood-prone areas which is currently estimated to be 500,000 (UN-OCHA, 2006) and shows that flooding has a potential to cause large scale livelihood failure and humanitarian crisis in the country.

Thus, with the apparent change in the nature of flooding and the increasing vulnerability of people to its effects, the current study found it to be a high time to study the resilience and coping strategies of rural households in the face of flood disasters. Moreover, a focus on the factors that determine the resilience of livelihoods is crucial as the continued effects of seasonal hazards such as flooding make people more vulnerable to other major subsequent shocks and stress factors. These shocks and stresses in turn slow down the pace of development and create further poverty and destitution in regions that have apparently been showing signs of recovery from decades of droughts and famines. The Amhara region is one such region which in recent years, has been affected by severe and frequent floods with increasingly large numbers of people being affected and exposed to food shortages and food insecurity.

Cognizant of this fact therefore, this study attempts to look into the factors that determine the livelihood resilience of rural households in the face of flood disasters. Moreover, it deals with the documentation of the effects of flooding on peoples' livelihood and the types of strategies that households employ to cope with flooding as a major livelihood shock in *Dembia wereda* of Amhara region.

1.2. Statement of the Problem

It is widely recognized that droughts, floods, landslides, earthquakes, and many other natural disasters frequently affect the livelihoods of many people around the world. The effects of these disasters can not be expected to be similar as people and nations differ in terms of their level of development, which largely determines their response to specific disasters. This implies that natural hazards have severe consequences for people in poor countries as they lack the capacity to recover timely from the effects of the hazards. In this regard, the United Nations International Strategy for Disaster Reduction (UNISDR) considers flooding as one of the most frequent and destructive natural hazards that occur annually worldwide (UNISDR, 2006). This is evident when one considers the number of people affected by flooding in the recent decade. For instance, according to IFRC's (2006) report, floods have affected about 74 million people in 2005 and accounted for more than half of the numbers of people reported to be affected by hydro- meteorological disasters within the decade from 1996 to 2005.

In Ethiopia, despite being given relatively less attention as compared to drought, flooding has long been recognized as one of the natural hazards that often develop into a disaster affecting the lives and livelihoods of people for many years. In fact, flooding and its damages are considered as a perennial phenomenon in the highlands (DPPC, 1994). The country's proneness to non-drought disasters such as floods has been limited in the past in terms of frequency and scope (DPPC, 1997). Recently however, there is an observable trend which indicates an increase in the frequency and magnitude of flooding in many regions, posing a growing threat to many livelihoods. Flooding as a recurrent climatic hazard is particularly felt in areas where people are already vulnerable to any adverse climatic event as a result of weak resilience. Some sources estimate the number of people vulnerable to any shocks with the highest possibility of facing livelihood problems like food insecurity to be around ten million (FAO, 2006).

Although, flooding as a problem has not been adequately studied in Ethiopia, available information indicate that some areas in the country are more frequently affected than others, to the extent of being labeled as ' flood-prone areas'. These include central and

western zones of *Tigray*; north *Gondar*, north and south *Wello*, and *Oromia* zones of Amhara region which are often affected by flash floods as well as those that are affected by riverine floods, which include almost all the major river basins and the *Tana* basin (DPPC, 1994; 1997).

The Amhara region as indicated above is one of the flood-prone areas in the country where severe and frequent floods affect a considerable number of people in recent years. In this regard, the limited available data on the effects of floods in the region indicate that riverine floods were recorded in 1966, 1967, 1974, and 1975. Severe flash floods have also been recorded in 1993 and 1996, with 72,569 people being affected. And the recent flooding in 2006, has affected 107,286 people, displacing 37,982 of them, damaging crops on 18,000 ha of land in six zones (DPPA, 2007; DPPC, 1997). Moreover, seven *weredas* in the region, which are all found around Lake *Tana*, are particularly well known to be areas which are frequently affected by both flash and riverine floods. One of these areas is *Dembia wereda* in North Gondar zone, which is highly affected by *Megech*, *Derema* and *Gumero* rivers that frequently overflow their banks affecting the nearby settled plains (*ibid*).

Flooding in *Dembia wereda*, has become all too common in recent years, and remains the most serious challenge to peoples' livelihood with its short and long term effects. As a result, some people were forced into destitution and left at the mercy of relief assistances (e.g. DPPA, 2007; UN-OCHA, 2006). When this, coupled with the increasing flooding scenario predicted by the reports of the Intergovernmental Panel on Climate Change (IPPC, 2001; 2007) amplify the magnitude of the problem. Furthermore, the problem of flooding would particularly be worse for countries like Ethiopia with the majority of their population subjected to poverty and vulnerability to climatic shocks. And this in turn justifies the need to study flooding as a livelihood problem which creates downward pressures on livelihoods. The understanding of flooding as a livelihood shock in turn needs an analysis of resilience of livelihood systems and their coping strategies. In this regard, Walker et al. (2004), cited in Marschke & Berkes (2006), contend that the concept

of resilience can be used as a tool to investigate the impact of shocks to better comprehend livelihood dynamics.

Although various studies are conducted on natural disasters and their effects on people's livelihoods in Ethiopia, the majority of them were done on droughts which for the most part, neglected flooding. Moreover, a broader livelihood-based approach to the study of the effects of natural hazards, particularly flooding has not been well studied and documented. The few available studies on floods also focus on issues such as risk perceptions and risk management strategies and overlooked the issues of livelihood resilience and coping strategies within the broader livelihood framework (e.g. Ashenafi, 1978; Lemma, 2003). In view of this, therefore, this thesis attempted to study the livelihood resilience of rural households as referring to their ability to withstand and recover from flood-induced shocks as well as documenting their coping strategies at times of flooding in the study area. The study is thus motivated by an endeavor to generate empirical facts with regards to the determinants of livelihood resilience, which needs to be fostered, if the objective of achieving sustainable development in rural areas is to be fulfilled.

1.3 Objectives of the study

General objective:

The overall objective of the study is to assess the livelihood resilience of rural households in *Dembia wereda* in the face of flood disasters.

The specific objectives of the study are:

- To assess the nature of flooding in the *woreda* in terms of its seasonality, frequency and duration
- To assess the effects of flooding on the livelihoods of people in the *woreda*
- To investigate the coping strategies employed by households in response to the flooding problem in the *woreda*.
- To identify major factors that determine the livelihood resilience of households in the face of flood disasters in the *woreda*.

1.4. Research questions

In this study, the following key questions will be addressed.

- How does flooding affect the livelihood of the people in *Dembia wereda*?
- Are all households equally affected by the floods in the *wereda*? .Which types of households are vulnerable to the effects of floods?
- How are rural households coping with the effects of floods in the *wereda*?
- What are the possible constraints that hamper households' coping strategies to effectively withstand the ill-effects of flooding in the *wereda*?
- What factors determine households' livelihood resilience in the *wereda*?

1.5. Significance of the Study

Flooding as a livelihood shock in Ethiopia has not been systematically studied and documented thus far. However, the frequency and severity of floods in the country seems to be on the increase associated with the increase in the vulnerability of rural households due to factors that weaken their capacity to cope with such a shock. Therefore, the identification of the factors that shape the resilience of rural households to flood disasters as well as the documentation of the types of coping strategies employed by these households could be used to inform policy makers to better lessen the ill effects of natural hazards on peoples' livelihoods and indicate intervention points to enhance coping capacities of rural households. Furthermore, the study would provide first hand information for researchers and development organizations that would like to engage in further studies or plan and implement projects and programs in this area. Therefore, the study from both practical and academic points of views could be of help in the understandings of how natural hazards affect livelihoods and why people feel the effects of shocks differently and what determines their resilience.

1.6 Scope and limitation of the study

This study attempted to examine the resilience of rural households to flood induced problems in *Dembia Woreda* of Amhara Region as one of the flood-prone areas in the country. Despite the wide-ranging use of the concept of resilience in fields like ecology

and psychology, the study only focuses on the livelihood resilience of rural households with due emphasis on the major factors that influence the resilience of households in the face of flood disasters. Moreover, the analysis of the nature of flooding through the use of hydro-meteorological data such as rainfall variability and distribution is beyond the scope of the study. As a result, the study relies mainly on the perceptions of local people and *woreda* level experts in an attempt to discern changes in the nature of flooding in the study area.

The current study has faced some of the following limitations: First, assessing factors that determine the resilience of people in the face of natural disasters needs to take in to account change in the livelihood conditions of people over time and space. And to accomplish this, data collected by using longitudinal survey design would have been advantageous. However, this study relies on cross-sectional survey design and only shows the factors that determine their resilience at a time when the data was collected. To offset this limitation however, the study attempted to obtain data on the previous livelihood conditions of households by using key informant interviews.

Second, the lack of secondary sources related to flood-disasters in the country was a major limitation faced while conducting the research. This was particularly worse at zone and *woreda* levels where there is a shortage of regular and updated data on flood disasters. Even worse, those data that were kept in the *woreda* archives suffer from a lot of fragmentation and inaccuracies. Hence, this has forced the research to rely more on data obtained from key informant interviews. Second, time and budget constraints have limited the study to two *kebeles* and 84 sampled household heads which might affect the applicability of the findings to wider contexts.

Third, there was shortage of empirical studies related to the issue of livelihood resilience in the context of flooding in the country. As a result, the study was forced to rely more on empirical findings on floods and their effects on livelihoods obtained from abroad. This to a certain extent might limit the application of some of the lessons drawn from such studies owing to socio-economic and contextual differences.

1.8 Organization of the thesis

The study is organized in six chapters. Chapter two, deals with the definition of some key concepts like livelihood resilience, coping strategies, vulnerability, flooding and other related concepts. Moreover, it provides the theoretical and conceptual framework used in the study. Chapter three discusses the research design, methods of data collection and analysis. A general description of the study area is briefly discussed in chapter four. Chapter five, deals with the overall findings of the qualitative and quantitative surveys as well as the discussions of these findings. The last chapter provides conclusion and recommendations based on the salient findings of the study.

CHAPTER TWO

LITERATURE REVIEW

2.1 Definition and Concepts

There is a growing body of literature that focuses on livelihood adaptation, vulnerability and resilience as central concepts in the broader issue of sustainable livelihoods (Scoones, 1998). Various studies have also indicated that the analysis of resilience of people is important in the understanding of their livelihood and in designing various interventions geared towards ensuring their livelihood sustainability. In this regard, Marschke and Berkes (2006) assert that the concept of resilience and its analysis can better serve to illuminate the dynamism involved in peoples' livelihoods, particularly in terms of examining the effects of shocks and stresses. Thus, owing to the value of the concept of resilience, this chapter of the paper deals with the discussion of core concepts and definitions related to livelihoods and resilience.

Following Chambers and Conway (1992), Carney (1998) gave the following definition of livelihood which is widely used in development literature:

A livelihood comprises the capabilities, assets (including both material and social resources) and activities required for a means of a living. A livelihood is sustainable when it can cope with and recover from shocks and stresses and maintain and enhance its capabilities and assets both now and in the future, whilst not undermining the natural resource base (Carney, 1998:4).

This definition clearly implies that resilience is the key criterion in ensuring the sustainability of livelihoods, as it refers to the ability of a livelihood system to be able to cope with and withstand shocks and stresses without suffering social, economic and environmental damages (Scoones, 1998).

A glimpse at the origin of the concept indicates that livelihood resilience as a concept applied in the sustainable livelihood approach to development is mainly drawn from ecological theories, in which the term "resilience" has been used to mean "the capacity to

withstand and “bounce back” from a disturbance”(Brown *et al.*, 2006:4). According to Luttrell (2001), the dominant assumption until late 1970’s, in ecological theories stressed on the ideas of equilibrium and stability, in which resilience was defined as “the ability of a system to absorb change and still persist” (Holling, 1973 quoted in Luttrell, 2001: 20). This definition suggests not only the normal functioning of a system, under conditions of stress but also its ability to return to its previous conditions or state of affairs by maintaining its stability(Dow,1992). The new ecological theories, however, take into account the existence of instability, fluctuations, shocks and disequilibria, as part of any ecological system, as well as the transformation of a system from one state to another (Luttrell,2001).Thus, these theories define ‘resilience’ as “the magnitude of disturbance that can be absorbed before a system changes its structure” (Holling *et al.*,1995 as quoted in Luttrell,2001:20) or as “the ability to return to the reference state (or dynamic) after a temporary disturbance”(Grimm and Wissel,1997 as cited in Luttrell,2001:20).

Luttrell also notes that the ‘new ecological theories’ have greatly influenced the use of the term ‘resilience’ in the social sciences, particularly in the development theories, through their emphasis on change. Brown *et al.* (2006:4), also assert that the concept of ecosystem resilience, with its emphasis of the features of “persistence”, “adaptability”, “variability” and “unpredictability” has a major implication for “evolution” and “development”. All these definitions indicate the importance of the concept of resilience in shading light on the dynamism involved in livelihoods and the ways in which livelihood systems maintain sustainability in the face of changes.

Shocks and Stresses

Shocks generally refer to sudden events that disrupt the day to day activities of people. According to Ellis (2000), shocks can cause a considerable damage on rural livelihoods mainly through their effects on either direct asset destruction or indirect asset erosion. Blaikie *et al.* (1994),also indicate that shocks could emanate from nature(as in the case of natural hazards such as drought, floods, outbreaks of epidemics, etc) or result from the consequences of human action that often exacerbate the effects of natural hazards such as

war, instability and environmental degradation. This stresses the point that there is an interaction between nature and the human condition.

Stresses, as defined by Satge *et al.*(2002), refer to “long term trends that undermine livelihoods potential including decline in the quantity and quality of stocks of natural resources, climate, political instability economic decline etc, that negatively impact household livelihoods” (Satge et al., 2002: 156) Scoones (1998:7), characterize stresses as “small, regular, predictable disturbances, with a cumulative effects”. This definition shows that stresses are often distinguished from shocks having ‘normal variability’ unlike shocks that introduce elements of surprises. However, some writers argue the practical impossibility of making a clear distinction between the two concepts as there is often an overlapping of the concepts at a household level which indicates that “what may be a stress for one household may be a shock for another. Moreover, a shock at one scale may be a stress at another scale, or vice versa.” (Marschke and Berkes,2006:3). This implies the existence of socio-economic gaps among households and communities, which tends to be reflected in their ability to shoulder such adversities.

Household coping strategies

Ellis (2000:61), defines household coping strategies as “the sequence of survival responses to crisis or disaster”. He also describes them as “...the involuntary response to disaster of unanticipated failure in major sources of survival” (*ibid*) This can be taken to apply to a range of shock events that can disrupt livelihoods with different consequences, such as flooding and people’s responses to these shocks.

Ellis also distinguishes between coping and adaptive strategies in which the later refers to “the way households respond over the long term adverse events, cycles and trends” (Ellis, 2000: 45) Similarly, Scoones(1998:6), assert that adaptation has to do with “long term shifts in livelihood strategies” while coping is temporary adjustments in the face of change”(*ibid*).

According to Scoones (1998), coping strategies are not always effective in terms of yielding positive livelihood outcomes and their effectiveness depends on the extent of the effect of the shock and access and use of livelihood assets. This highlights the issue of focusing on resilience of households as describing their capacity to withstand and recover from the effects of shocks and stresses in the face of natural hazards.

2.2 Natural disasters, vulnerability and livelihood resilience

The literature on natural disasters at least in the recent past, emphasized more on the physical aspects and neglected peoples' vulnerability. It described vulnerability as a physical exposure to hazardous events (e.g. Key, 1995). Recently however, there has been a shift in the understanding of natural disasters, which starts to view them in terms of both physical exposure and people's vulnerability as a result of specific socio-economic systems (Cannon, 2000). In this regard, Satge *et al.*, (2002) describe vulnerability as referring to:

the characteristics that limit an individual, a household, a community, a city, a country or even an ecosystem's capacity to anticipate, manage, resist or recover from the impact of a natural or other threat (often called a 'hazard' or 'natural trigger'). These characteristics influence the extent to which an individual, a household, community [...] is likely to be negatively affected by a hazard or other threat. (Stage et al., 2002:197).

As it is implied by Stage *et al* (2002), the concept of vulnerability can be viewed as a result of an interaction between peoples' capabilities determined by their socio-economic positions and their exposure to hazardous events. In view of this, Brown *et al.* (2006:4) describes vulnerability as "the propensity to suffer from some degree of loss from hazardous events. It is comprised of a system's exposure to a hazardous event and its ability to cope with or adapt to the impacts" (IISD, 2006:4). Such definitions are useful as they illuminate the critical relationships between social and natural systems that constitute a major part of rural livelihoods.

In addition, such conception of vulnerability as Cannon (2000), argues is very important in the study of natural hazards, which needs to go beyond the issue of exposure to hazards to include the specific social, economic and political conditions in which people live. Cannon also maintains that vulnerability should be analyzed as having differential impacts on people's livelihood. He also identifies five interrelated components of initial well-being, vulnerability, self-protection, livelihood resilience and social capital, which are strongly related to and shaped by the severity of certain hazards and the specific social, political and economic processes.

This view is further strengthened by Hewitt (1997:153) who notes that "vulnerability is maintained by economic and other conditions. It is reproduced by the activities that sustain unsafe living conditions for some, or disempowered them, and changes only if these conditions are transformed".

Livelihood resilience as a major component of the social vulnerability of people as shown by Cannon (2000), therefore needs to be studied as it highlights people's capacity to cope with and adapt to the ill-effects of natural hazards. This is particularly useful in developing countries such as Ethiopia where a significant number of people are affected by natural hazards, that worsens their livelihood conditions compounded by the lack of effective coping measures. Studying the resilience and coping capacities of livelihood systems in turn needs to take in to account the following points:

First, resilience should be viewed in terms of the occurrence and effects of specific hazards (e.g. floods). This as Handmer (2003:59) notes is essential as individuals or households are "circumstantially dependent" and resilience is more likely to be hazard specific". This in turn seems to suggest the need to focus on context-specific and household based studies to better grasp the essence of resilience.

Second, the study of resilience at household level needs to analyze a range of factors that determine the effects of hazard specific shocks and stresses on livelihoods (Scoones, 1998). In view of this, various studies suggest that the effects of certain natural hazards

on people's livelihoods depend mainly on factors related to social systems rather than on the mere occurrence of natural hazards (e.g. Belieneh, 2003; Cannon, 2000; Degefa, 2005; Lemma, 2003; Mesfin, 1986). Thus, in the context of understanding flooding as a livelihood shock, it should be noted that flooding is a natural event that often results from excessive rainfall and associated run-off, which are not necessarily related to disasters. Flooding only turns to disaster when it causes damages on livelihoods, which is mostly experienced through the economic activities of people. These activities in turn largely depend on exploiting natural resources from the environment and help to shape the vulnerability of livelihoods (Cannon, 2000; Lemma, 2003).

Vulnerability to flooding

Blaikie *et al.* (1994) explain vulnerability to flood hazards in terms of three interrelated processes that shape the vulnerability of people to flood hazards. These processes are described as:

1. Root causes, referring to the system of access, control and use of resources such as land, tenure regime, together with demographic and environmental conditions.
2. Dynamic pressures, referring to the socio-economic system that create and aggravate poverty, inequality and discrimination.¹
3. Unsafe conditions, which mainly involve the capacity of livelihoods to prepare for and prevent disasters such as types of settlements, the supply of physical as well as social infrastructures, warning systems, etc.

Similarly, Cannon (2000) view vulnerability as an ongoing condition of people that derive from their socio-economic position, and therefore go beyond their exposure to a certain hazardous event. As to flooding and people's vulnerability, Cannon explains that floods generate differential impacts up on peoples' livelihoods depending on their "vulnerability pattern" as determined by socio-economic factors exposing them to

¹ *Political ecology and political economy*

These concepts are also related to the issues of vulnerability. Political ecology refers to the study of how political, economic and social factors affect environmental issues. Some political ecology utilizes the framework of "political economy" to analyze environmental issues.

hazards. Specifically, Cannon identifies gender, class and ethnicity as factors that indirectly determine a person's vulnerability to flooding.

Moreover, vulnerability to flood hazards is also attributed to human activities which locate people in flood prone areas. Thus, Hoyt and Langbein (1966:17), note that "human settlement in flood plains can turn a flooding into hazards, disasters and problems, people settle in flood plains due to their economic importance for agriculture, where alluvial soils exist". This assertion however does not imply that the mere existence of settlement in flood plains can be totally taken as a cause to flood vulnerability, which brings us back to the need to appreciate and study factors that are beyond physical exposure to floods, such as vulnerable socio-economic and livelihood systems.

2.3 Livelihood resilience: indicators and determinants

Natural hazards such as flooding are normal events that happen all the time, but they only create disasters when there is a vulnerable livelihood system which indicates that vulnerability can spring from a system's exposure to hazards and its internal ability to withstand and recover from its effects-representing its resilience (Brown *et al.*, 2006). However, as it has been already indicated in the previous section, physical exposure to hazardous events cannot be necessarily taken to cause disasters. This in turn, implies that the issue of resilience should be emphasized as many of the aspects of vulnerability strongly relate to resilience as a concept that helps to explain coping in the face of disasters (Blaikie *et al.*, 1994).

Resilience as a crucial factor in reducing vulnerability and therefore achieving sustainable livelihoods has been recently considered as a major priority area by many organizations in their research, policy and program development activities (Maguire and Hagan, 2007). Similarly, Adger (2000: 2), assert that "resilience increases the capacity to cope with stresses and is hence a loose antonym for vulnerability". In view of this therefore, this section presents some of the indicators and determinants of livelihood resilience.

2.3.1 Indicators of livelihood resilience

Various studies suggest that social groups, households or communities differ in terms of their ability to withstand and recover from the effects of shocks (e.g. Maguire and Hagan, 2007; Brown *et al.*, 2006; Handmer, 2003). Such differences in the level of resilience clearly imply the notion of the availability of indicators by which households or communities are said to have a certain level of resilience. In this regard, some writers like Maguire and Hagan (2007), note that resilience has the properties of resistance, recovery and creativity. The same authors also state some specific indicators for social/livelihood resilience such as the existence of high social capital and the level of resource dependency.

Others like Blaikie and Brookfield (1987), as cited in Luttrell (2001), maintain that resilience needs to accommodate change while maintaining the existing livelihood conditions and take this attribute as a sign of high resilience. Marschke and Berkes (2006), also take flexibility in livelihood strategies, particularly the extent of diversification of livelihood activities as both a sign and indicator of high resilience.

Handmer (2003) makes a distinction between two categories of resilience indicators as macro indicators, that are related to general welfare conditions of a community including life expectancy, infant mortality, employment, education, etc... and micro indicators which are less formal but crucial aspects of resilience at a household level such as social networks, access to and use of natural resources, household income level, etc...

2.3.2 Determinants of livelihood resilience

Luttrell (2001) proposes that livelihood resilience is shaped by the system of access to resources which is in turn shaped by the prevailing institutional arrangement. Accordingly, both formal and informal institutions as well as historical and geographical contexts determine livelihood resilience. Leach *et al* (1999) as cited in Luttrell (2001) also mention household characteristics like gender and age as a factor that shape livelihoods

and their resilience. However, asset holding is taken as one of the crucial determinants of livelihood resilience in the literature. In this regard, Soussan *et al.*, (2003:2), equate asset holding with resilience by arguing in the following manner “in general, the more affluent a household is, and in particular the more assets it possesses, the more resilient it is to disruption in its livelihoods base from [...] shocks and trends”.

Similarly, Brown *et al.*, (2006) note that access to and use of livelihood assets is a key factor in enhancing resilience to natural disasters such as floods. According to them, this allows people to engage in livelihood activities that would help them to diversify their livelihoods which in turn contribute to increase their resilience.

Writers like Handmer (2003) on the other hand argue that resilience is more explained in terms of the availability of social capital than entitlements or access to physical resources such as land.

Generally, the resilience of households to the effects of shocks and stresses that are introduced by natural hazards such as flooding is shaped by a range of factors that often put the households in vulnerable positions. In view of this, Satge *et al.* (2002) discuss three interrelated issues as factors that determine the resilience, strength and protective capacities of households at times of hazards these are:

- the physical, social and other capabilities of household members that help protect important assets and livelihood activities, and allow for investments with the purpose of adapting to changing conditions.
- the sustainability of household assets and livelihood strategies, in response to likely threats
- the levels of household protection provided by its assets and livelihood activities in response to likely shocks and stresses (Satge *et al.*, 2002:197)

In sum, drawing on the foregone discussions, it can be noted that the availability, access and use of livelihood assets or resources such as land, livestock and labor coupled with social capital and specific characteristics of individual household members in terms of

their level of education, age, level of risk perception, gender, etc ...can be taken as factors that determine the resilience of households to nature-induced shocks. However, other factors related to the specific choices made by households on how to deploy their assets in order to generate livelihood income are also important. Moreover, the specific livelihood strategies pursued by households such as diversification together with institutional capabilities that provide protections in terms of safety-nets and insurances are of a paramount importance in determining the resilience of households in the face of natural hazards such as flooding.

2.4. Flooding an Overview

Flooding is the inundation of land by the rise and overflow of a body of water. This happens usually when there is excessive rainfall or precipitation which exceeds the retention capacity of the soil causing run-off. Flooding is recognized as the major natural hazard that by far exceeds other natural hazards in terms of frequency of occurrence and damages. According to some official reports, floods kill many people and inflict a huge amount of economic loss on a global scale (IFRCS, 2006, Munich Re, 1997, Blaikie *et al.*, 1994). For instance, the International Federation of Red Cross and Red Crescent Societies in its annual World Disasters Report states that floods have affected more than 75 percent of the total people reported to be affected by disasters on a global scale in the decade from 1990 to 1999. Moreover, floods account to 34 percent of all recorded disasters in the same decade (IFRCS, 2000).

2.4.1 Causes, types and trends of flooding

The major and direct cause of floods is the run-off of water on land. This, however, is in turn caused and aggravated by a number of interrelated natural and man-made factors (UN, 1997). Nevertheless, it is generally accepted that the process of hydrological cycle, which is responsible for the creation of precipitation is at the root of the occurrence of flooding. Precipitation in the form of rain or snow reaches the ground to either infiltrate into the soil or run directly into water bodies, depending on vegetation cover, the absorption capacity of the soils, and the nature of the terrain in an area. Moreover, human

interference or economic activity on the environment, often aggravate the frequency and intensity of floods. Human interference including deforestation, which increases run-off by clearing the vegetation cover that helps to intercept and absorb the power of down pours; poor-farming techniques that aggravate soil erosion; overgrazing; expansion of physical infrastructures such as asphalted roads, buildings, etc can be mentioned as factors that reduce the infiltration of water into the ground and thus contribute to increased flooding (UN, 1997: 12-13).

2.4.2 Climate change and increasing flooding scenario

In recent decades, flooding is showing an increasing trend in terms of its frequency and severity. According to IFRCS (2006), floods have accounted to about 40 percent of all hydro-meteorological disasters that have occurred in the years from 1996 to 2005. Moreover, the same source discloses that “the number of reported natural disasters was up 15 percent from 2004, mainly due to a 50 percent increase in floods” (IFRCS, 2006:95). Thus, as a result of this recurrent climatic shock, the number of people affected has also increased by 7.5 million worldwide.

Thus, the increasing frequently and severity of the recent floods has been attributed to several interrelated causal factors. However, despite the problem of attributing the incidence of flooding to one factor with a level of certainty, the issue of climate change has, over the years, stood out as a major causal factor for the increasing floods. For instance, the Intergovernmental Panel on Climate Change (IPCC), assert that floods will increase in their frequency and severity pertaining mostly to the effects of climate change- a fact that can no longer continue to be a debated issue as it's presence is strongly felt (IPCC,2001).

Others attribute the frequency and severity of floods to human activities related with economic development, particularly to urbanization and Industrialization, which in general have “reduced infiltration and increased the speed in which water runs-off, leading to a more frequent and higher floods” (Miller, 1997:20).

2.4.3 The effect of flooding on peoples' livelihoods

Floods as a recurrent climatic shocks have both short-term effects and long-term impacts on people and their livelihoods. In this regard, Cannon (1990) notes that flooding can induce problems of asset loss or destruction, ill-health, loss of income, and loss of food security.

The typical effects of flood hazards include death of people and livestock due to drowning or as a result of epidemics and diseases; physical damages on houses, public infrastructures such as roads, schools and hospitals and the associated economic losses and damages on crops, food and water supplies.

However, flooding like any other disaster has varied impacts on people as dictated by their socio- economic positions. Thus, the effects of flooding depend mainly on the vulnerability context of people. This indicates that not all people in an area lose due to flooding, but some may even gain out of it (Cannon, 1990). Despite this, however, it can be generally argued that flooding can have a serious effect on the livelihoods of the poor in developing countries like Ethiopia, where a large majority of the rural population is already vulnerable to the effects of any climatic shocks.

Various studies made on the socio-economic impacts of flooding reveals that as the occurrence of flooding rise peoples vulnerability to associated hazards appears to be on the increase. Chan and Parker (1996) in their study of flood-hazard factors in peninsular Malaysia, discuss flood damage potential in Kelang river where both direct and indirect flood damages affect livelihoods and economic development in the area through asset destruction, crop damage and income losses. A similar study made in China also reveals that in the 1990's the economic losses incurred as a result of severe floods have reached about 67 billion USD, which is a clear indication of the extent of flood damages on the livelihoods of millions of people (UN, 1997).

Similarly, Penning-Rowsell (1996), in their study of flood-hazard response in Argentina, indicated that severe flooding poses a problem to the lives and livelihoods of people in the Parana, Paraguay, Uruguay river system, where flooding caused loss of life, and economic losses in the region.

The literature on flood-hazard response suggests different flood control and mitigation measures ranging from forecasts to the construction of flood control structures. These measures mainly consist of structural and non-structural adjustments with focus on strategies that attempt to avoid hazards. In this regard, Hoyt and Langbein (1966) suggest a wider flood management approach to flood hazard mitigation that incorporate flood-plain zoning, forecasting, insurance and relief and rehabilitation. Moreover, they also suggest the construction of dikes, levees, channels, reservoirs and the diversion of flood waters as part of the solution for alleviating the problem of flooding. However, the general effectiveness of these measures is doubtful, when viewed from the stand point of households and communities that have to live with the risk of facing prolonged disasters as such measures only postpone the occurrences of the much devastating disasters to a later period (Shaw, 2006).

Studies on local coping and adapting strategies have identified some measures such as flood-adapted houses (Chan and Parker 1996). However, these coping strategies may prove inadequate and at times, may even increase the vulnerability of rural households due to the massive poverty in rural areas which forces them to pursue distress-induced disposal of assets. Thus, as Chan and Parker (1996) asserts, an integrated approach in flood mitigation measures geared towards reducing poverty and increasing the resilience of the poor is needed.

2.5 Flood disasters in Ethiopia

Studies concerning flooding, particularly as it is related to livelihoods, are very limited in Ethiopia. This is partly to be expected as the country is very much known to have been affected by a series of droughts which have been the center of attention, and thus

overshadowing any academic or applied research made thus far on other natural calamities. However, certain attempts have been made by some studies either to investigate flooding as a livelihood problem separately, or as a natural disaster accompanying other livelihood shocks, mainly drought. Thus, this section, would attempt to provide a review of some of these studies, following a general overview of flooding in the country.

2.5.1 Historical Background

The available scant historical records on the incidents of flooding indicate that there are well-known flood-prone areas in the country that are frequently been affected by floods. These areas are almost entirely located in and around the major river-basins, including areas around Lake *Tanna* (DPPC, 1994). Moreover, flooding caused by excessive seasonal rainfall is noted as a perennial adverse event, in the highlands that frequently causes a certain level of damage on the livelihoods of the people. However, little is known and documented about these flooding and the extent of damage they cause.

The earliest flood damage has been recorded in the period between 1955 and 1960, where flooding has killed several people and destroyed assets in places like *Wello, Debre Markos, Jimma, Arssi, Tigray, Bale Goba, Debre Brehan* and *Bahir Dar* (DPPC, 1994). Flooding damages have also been recorded from 1961 to 1978, in several areas in the country, where it has killed people, livestock and destroyed property and public infrastructures (*Ibid*)

Although there is a lack of documentation related to flooding and its damages after 1978, it is possible to assume that flooding associated with the rainy seasons is a regular event having certain impacts on livelihoods. In this context, the worst flooding have been recorded in 2006, affecting more than 428,800 people in five regions of the country (DPPA, 2007).

2.5.2 Types and causes of floods in Ethiopia

According to some studies, riverine and flash floods are recognized as the two types of floods that frequently occur in Ethiopia (e.g. Ashenafi, 1978; DPPC, 1997; DPPA, 2007). Riverine flooding is caused by the overflow of water from river banks to adjacent lands and it usually occurs in the main rainy season or *Meher*, while flash floods are caused by a sudden, heavy and torrential rains with relatively short duration in a limited area, causing a high run off (DPPC, 1997) Although both types of floods result in a considerable amount of damages on livelihoods, flash floods are relatively more fatal and damaging as they are sudden and unpredictable (DPPC,1997; Munich Re, 1997)

2.5.3 Flood-prone areas and vulnerability to flooding

A study made on flood risks and vulnerability in different regions in Ethiopia by Ashenafi Moges in 1978, identifies seven areas as vulnerable to flooding which include, the *Wabe Shebelle* river basin, from *Imi* to *Mustahil*, the *Baro* river basin, the *Awash* river basin the *Gumera* and *Ribb* rivers east of *Lake Tana*, the *Teji* depression, the lower reaches of the *Omo* river, and other areas like *Robi*, *kobo*, *Addis Ababa* and *Chefa*. Another study conducted by DPPC (1997:29),also claims that “flash flood is a problem in most parts of the country”, and identifies the most frequently affected regions as *Tigray* (central and western zones), *Amhara* (North Gondar, North *Showa*), *Oromia*(North and west *Showa* and *Hararghe* zones),SNNPR (north *Omo*, *Gurage*, *Sidama* and *Hadiya* zones)and other urban centers.

An earlier study conducted by Ashenafi (1978) identifies the areas around *Lake Tana* as flood-prone areas, where two rivers-*Rib* and *Gumero* affect six *woredas*, including *Dembia*. According to the study, the rivers have been flooding these *woredas* since 1966. Moreover, the study identifies factors like heavy rainfall in the highlands, deforestation, and silt deposition in the river banks, together with the topography of the area, and some activities such as road constructions that changed the direction of river flows as some of the causes for the floods. The study also recommended both structural and non-structural flood mitigation and control measures, including the construction of flood dykes, the

diversion of flood water into rivers by using trenches and ditches, flood zoning and land use management. However, the study did not look into the local responses and coping strategies employed by people in the area. The study also applied an approach which fails to account for the factors that put people in vulnerable circumstances and instead focused on physical exposure to flood hazards.

Another research article by Lemma (2003), reports a survey result on community perceptions and responses to *Awash* floods in *Wonji* area. This study found out that settlement pattern near flood plains and flood risk perceptions are positively correlated. Moreover, the study documents structural and non-structural flood mitigation and control measures including residing in higher (elevated) grounds, the construction of dykes, temporary migrations and emergency relief. Although the study notes that importance of risk perceptions and local responses to flooding in the prevention of disasters, it did not look in to the resilience of local communities that helps to sustain any disaster prevention measures.

Similarly, Degefa (2005) identified flooding as a shock that affects the livelihoods of people in two communities in Oromia zone of Amhara region. He further indicates that flooding is a result of various interrelated factors in which atmospheric and topographic conditions are only a part. In this regard, DPPC (1997) also put the following factors as a major causes and aggravating variables to both flash and riverine floods. These include atmospheric conditions, which relates to the intensity, distribution and duration of rainfall; topographic conditions such as steep slopes or flat terrains; poor soil infiltration capacity, which aggravates run-off; sedimentation of river channels, often as a result of human activities such as deforestation; faulty structures such as dams, reservoirs, and poor water shed management and agricultural practices.

2.6 Analytical framework of the study

The conceptual framework employed in this study is the ‘sustainable livelihoods model’. This model takes the concept of ‘Sustainable livelihoods’ as a central theme, which has

recently been evolved to a level of universal acceptance as a reference point by policy makers and development practitioners alike (Satge *et al.*, 2002). The concept of Sustainable livelihoods is basically a product of the writings of Chambers and Conway in 1992, who provided a definition of livelihoods and factors that makes them sustainable (*ibid*).

Drawing on the works of Chambers and Conway a number of organizations have developed the sustainable livelihood framework as an analytical tool, to be employed in the understanding of livelihoods, their strategies and the factors that affect their livelihood security (*ibid*).

Soussan *et al.* (2003) view sustainable livelihoods as useful approach in terms of investigating the interactions among different factors that bear influence on livelihoods such as natural disasters. Moreover, the approach being drawn from the participatory and people centered approaches to development, view people as actors, employing different livelihood strategies in the face of certain adversities such as climatic hazards. Thus, it essentially differs from earlier approaches that used to view people as victims of nature who tend to rely on relief assistances when faced with adversities (Satge *et al.*, 2002) In addition, the approach recognizes that peoples' livelihoods are complex and dynamic as they engage in variety of activities which change overtime and space as they choose and employ different strategies with the deliberate intent of avoiding risks and increasing gains (Soussan *et al.*, 2003).

The major components of the 'sustainable livelihood model' as discussed by Soussan *et al.* (2003) are:

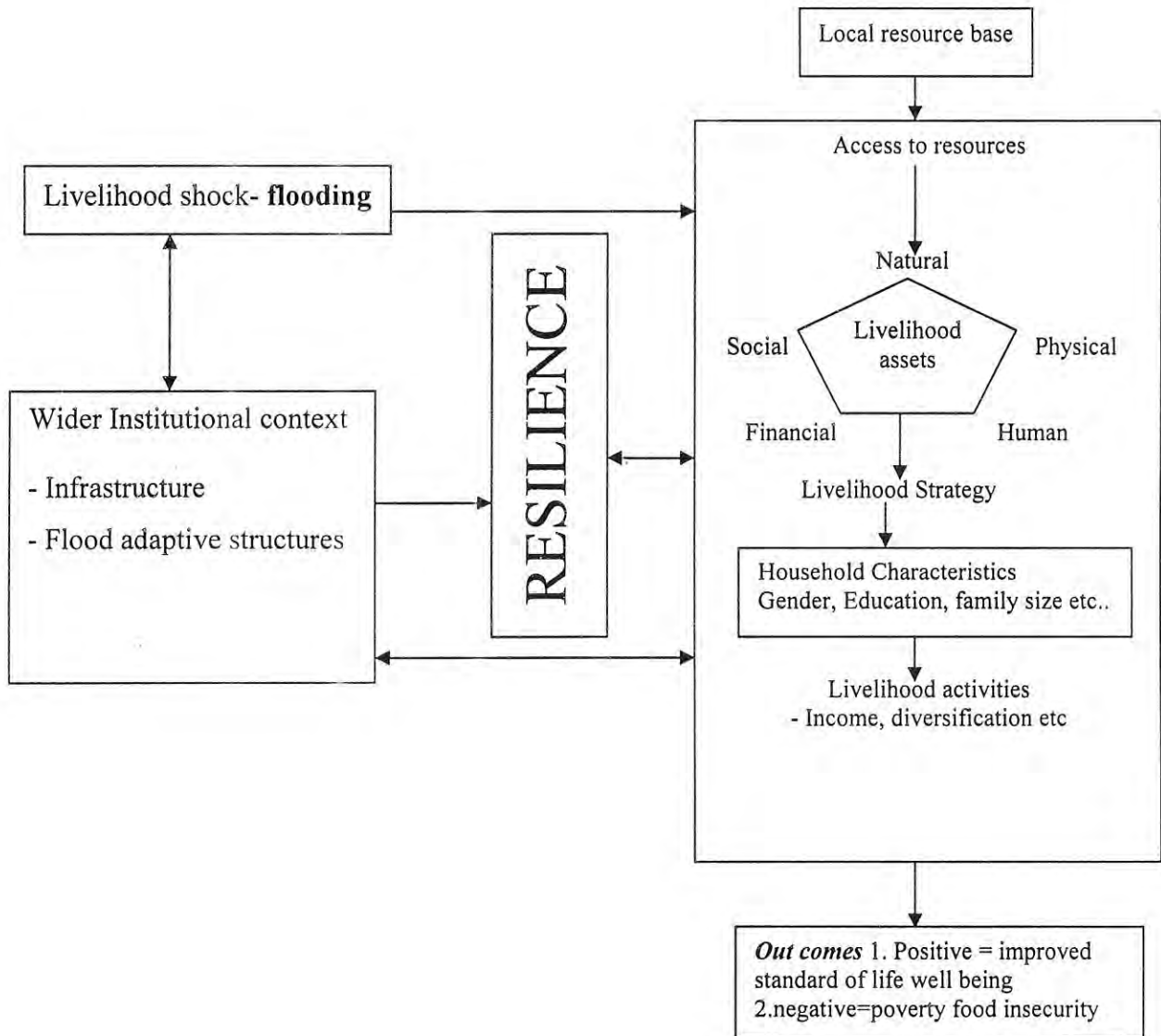
1. People's entitlements and their access to resource which refer to the capitals or **livelihood assets**, available to the household. Five livelihood assets or capitals can be distinguished as possessed by households. These are financial, social, natural, physical, and human capitals.

2. The livelihood asset possession of households and access to resources to a large extent determine their **livelihood strategy**, which refers to decisions or choices made by households about pursuing a particular livelihood activity.
3. The specific strategies pursued by households, in turn determine the **livelihood activities** of households, both in terms of inputs used like land, labor and other assets and out puts like crop production, livestock rearing, wage labor or trade.
4. The livelihood activities pursued by households in turn produce a flow of income which can be used for either consumption, saving or investments.

In addition to these major components of the model, Soussan *et al.* (2003), note the importance of the “wider natural environment” in people’s livelihoods mainly in terms of introducing various changes in the livelihood dynamics. Such external influences affect people differently depending on their resilience. Accordingly, the model of sustainable livelihoods is useful in helping one to plot the effects of external changes on livelihoods which are brought by interplay of a host of factors such as policies and institutional contexts, nature-induced shocks such as flooding that disrupt livelihoods. In this study, due emphasis is given to the identification of assets possessed by rural households and their roles in enhancing the resilience of livelihoods.

In addition, other factors related to household characteristics such as gender, family size, and educational status are also considered. Taking this into consideration therefore, a framework adapted from Soussan *et al.* (2003), is employed for the study as depicted in figure 1.

Figure.1. Conceptual Framework for analyzing factors that determine the resilience of rural households in the face of flooding.



Source: Adapted from Soussan, Blaikie, Springate-Baginski and Chadiwick (2003).

CHAPTER THREE

METHODOLOGY

3.1. Research Design

The study was primarily a descriptive type which used a mix of qualitative and quantitative approaches of data gathering and analysis. However, focusing on the study objectives and the major study questions, the study mainly devised qualitative research methods to exhaustively examine locally specific impacts of flooding, coping strategies and factors that shape the resilience of households in the face of flooding. Accordingly, the study made use of participatory research tools such as FGDs, interviews and problem ranking and scoring exercises to identify factors that determine the resilience of households, flood hazard coping strategies and some of the major effects of flooding on their livelihoods. In addition, the use of qualitative methods helped to assess how resilience is conceived in local contexts which in turn helped to gain an in depth understanding of the problem.

To supplement the qualitative data, a questionnaire survey in two selected flood prone *kebeles* was conducted to generate data on the livelihood asset profile of households', household livelihood activities, income portfolios and types of coping strategies employed by households in the study area.

3.2. Selection of the study area

The study was conducted in *Dembia wereda* of Amhara region. This *wereda* was selected for this study owing to the following reasons

1. The *wereda* is well-known to be among the flood-prone areas, in which regular and seasonal floods frequently cause damages to the life and livelihood of people. This makes it suitable area to study the nature of livelihood resilience, and the factors that shape it.
2. So far there is little research conducted in the area of flood disasters and livelihood resilience of people in the *woreda*.

3. Accessibility of the *woreda* which facilitates the timely completion of the research project.

3.3. Sampling design and sampling procedure

In selecting the sample households for the household survey, a multistage sampling procedure was employed. First, eight *kebeles* were selected from the 40 rural *kebeles* in the *woreda*. These eight *kebeles* were selected purposively as they were frequently hit by seasonal flooding. The floods are largely caused by the overflow of *Derma* and *Megech* rivers as well as the back flow of Lake *Tana*. The second stage of sampling involved the selection of two *kebeles* out of the eight flood prone *kebeles*. Hence, purposive sampling was used to select the two *kebeles* considered for the study. The severity and frequency of flood-disasters were used as criteria to select the two *kebeles* on the basis of information obtained from the *Woreda* Agriculture and Rural Development Office. Accordingly, it was decided to select *Tana weina* and *Gura Amba* as the most frequently and severely affected *kebeles*. These criteria were used to account for variations in the degree of flood-hazard exposure as all of the eight *kebeles* are not equally affected by the flood disasters. Hence, the two *kebeles* were selected out of the eight *kebeles* to ensure the representativeness of the sample drawn from the *kebeles*.

After selecting the two *kebeles*, a list of the households in 26 *gotts* (15 in *Tana weina* and 11 in *Gura Amba*) was recompiled and used as a sampling frame to select the households for the study. Thus, a sample consisting of 84 households which makes 6 % of 1675 households found in the study *kebeles* was selected by using systematic random sampling technique. In using this sampling method, the first household was selected randomly (after fixing the sampling interval) by using the lottery method which involved drawing 20 numbered and coiled piece of papers representing the first 20 households in the list from a lunch box. The sample size was found to be sufficient considering the time and budget available for the study.

3.4. Data Sources

The primary data for this study was gathered from households, as represented by an individual, usually the head of the household. Thus, households in the *wereda* were taken as units of analysis for the study. In addition, information pertaining to the research questions raised in this study was also gathered from local administrators, *wereda* level agricultural experts and agricultural and health extension workers.

The secondary data for the study was drawn from both published and unpublished documents including policy manuals, annual and periodic reports, academic journals, books, theses, magazines, and newspapers which provided basic information pertaining to the purpose of the study.

3.5. Methods of data collection

3.5.1. Primary data collection

The primary data for the study was generated by using a variety of data obtaining instruments, using both qualitative and quantitative methods such as household survey using structured interview schedule, key informant interviews and focus group discussions.

3.5.1.1. Structured household questionnaire

For the household survey, a structured interview schedule or questionnaire consisting of both open and closed ended questions was prepared and administered to a sample of respondents that were selected from two of the *kebeles* in the *wereda*. The questionnaire was pretested to check the adequacy of coverage and to improve its contents. Moreover, in order to assure the accuracy of the data collected, an instruction manual for enumerators was prepared based on feedbacks obtained from the results of the pretest which was also used as a training session for the seven enumerators involved in data gathering.

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The interview schedule contained questions divided in nine sections focusing on household livelihood activities, household livelihood assets, access to productive resources, vulnerability to flood-disasters, household resilience levels, and effects of flood-disasters on livelihoods, household coping strategies and challenges, and self assessment of household well-being.

3.5.1.2 Key informant interviews

Key informant interviews were employed to collect the necessary data concerning the conditions of livelihood resilience in the face of seasonal flooding disasters; the nature of flood disasters in the *wereda*; the effects of flooding and coping strategies employed by the households. Individual farmers who have rich knowledge about the flood conditions in the *kebeles* as well as officials and experts from the *Woreda* Agriculture and Rural Development office were interviewed as key informants. During the interviews semi-structured interview schedules were used.

Accordingly, three household heads, one female and two males, two DA's from the study *Kebeles*, four agricultural experts from the *wereda* agriculture and rural development office and one health programs coordinator from the *wereda* health office were contacted and interviewed as key informants.

3.5.1.3. In-depth individual interview

In-depth individual interviews were conducted with four heads of households (two male and two female) who were purposively selected from the survey respondents to gain a thorough understanding of the perceptions, experiences, extents and intensity of effects of flood disasters and vulnerability of households to flood induced shocks in the area. This also helped to validate the information gathered through the survey from other sources at a later stage. The respondents were interviewed in isolation from their friends and relatives to make sure that the answers would not be affected by arbitrary responses from persons around them. During the interview, attention was given to establish good rapport

with the households by explaining the purpose of the study with the view of getting their full co-operation in providing reliable data for the study. In addition, a method of informal dialogue was followed during the interview sessions which reduced the monotonous nature of formal interviews, helping to obtain more in-depth information from the informants.

3.5.1.4. Focus group discussions (FGDs)

Focus group discussions were used in the study to as the main tools to gather information from study participants and with the objective of yielding an in-depth insight into the livelihood resilience and perceptions of people towards flooding.

Three focus group discussions were conducted in the two *kebeles* purposively selected for the household survey by taking into account variations in the distance from the *wereda* capital and the availability of off-farm livelihood activities. The three FGDs were decided to be sufficient considering the budget available, the difficulty of obtaining participants within a short period of time and the similarity of experiences of potential participants on the issues involved.

Participants of the FGDs were selected on the basis of recommendations obtained from DAs and *wereda* agriculture and rural development office experts about the knowledge and experiences of people on issues relevant to the purpose of the study. Two of the three FGDs were conducted in *Tana weina kebele*, with participants who were identified to be frequently affected by floods at least for the past five years. The groups consisted of household heads representing both sexes. One of the FGDs was done with nine individuals from *Gura Amba kebele* focusing particularly on issues of livelihood activities. In each of the FGDs an expert from the *wereda* agriculture and rural development office, with the skills and experience of moderating FGD sessions was involved to facilitate the discussions and probe the participants to acquire relevant information.

3.5.1.5. Observation

The researcher observed the situation in the field through transect walk in the flood affected *kebeles* and directly observed and recorded the damages caused by floods, the coping strategies employed by the local communities and some of the livelihood activities and assets of the people.

In addition to the above data collection methods, some participatory matrix scoring and ranking of problems, resulting from flood disasters in the area were done with participants of FGDs on the basis of criteria identified by the participants.

3.5.2. Secondary Data Collection

Secondary data on the nature, frequency and magnitude of flood-disasters in the *wereda*, land use system, weather conditions, population, changes in livestock and food aid situations were collected from *woreda* Agricultural and Rural Development Office and Amhara National Regional State's Food Security Co-ordination and Disaster Prevention Office documentary files. Moreover, documents, reports and research journals from DPPA, ISDR, ERCS and Addis Ababa University were reviewed.

3.6. Method of data analysis

The analysis of the quantitative data gathered by using the structured household interview schedules /questionnaires was coded and entered into a computer for analysis for which a software program-SPSS was used. The specific methods of data analysis involved the use of descriptive statistics such as, frequencies, percentage computations and cross tabulations.

The analysis of qualitative data went along side with the data gathering process in the field, this procedure helped to accomplish data reduction and preparation by way of verbatim transcriptions of an audio tape and organization of notes taken from the field.

Specifically, content analysis technique of qualitative data analysis was employed with the view of identifying overarching themes related to the objectives of the research. Likewise, the procedure of analysis involved coding, categorizations, and checking of consistency of themes and opinion shifts during FGDs and interviews. Triangulation was applied with the view enriching the data gathered and as a crosschecking and verification strategy in the data analysis.

Data obtained from secondary sources such as documents, journals, reports, books, newspapers, etc were also thoroughly scrutinized with regards to their validity, reliability and authenticity. Moreover, attempts were made to maintain the objectivity and validity of data gathered by continuously cross-checking results obtained from different sources through triangulation.

CHAPTER FOUR

DESCRIPTION OF THE STUDY AREA

4.1 Location and Topography

Dembia woreda is one of the 106 *Woredas* of Amhara National Regional State. It is situated at 12°18'30'' N latitude and 37°17'30''E longitude. The *woreda* is one of the 18 administrative *woredas* of North Gondar zone and it is located north East of Lake Tana sharing boundaries with *Gondar zuria woreda* in the east and north east, *Lay Aremachio woreda* to the north and *Chilga* and *Alefa woredas* to the west and south west. *Kola Deba* is the capital of the *Woreda* and is found 781km from Addis Ababa and 213km from the Regional capital, *Bahir Dar* and 34km from the zonal capital Gondar. (see figure 2). It has 44 local administrative *kebeles*, of which, 40 are rural and 4 are urban (DWARO, 2006).

The total land area of the *Woreda* is 148,968 hectare from which plain land accounts for about 87%, mountain and hills 5%, Valleys and gorges 4.8% and water bodies 3.2%(*ibid*)

4.2 Population

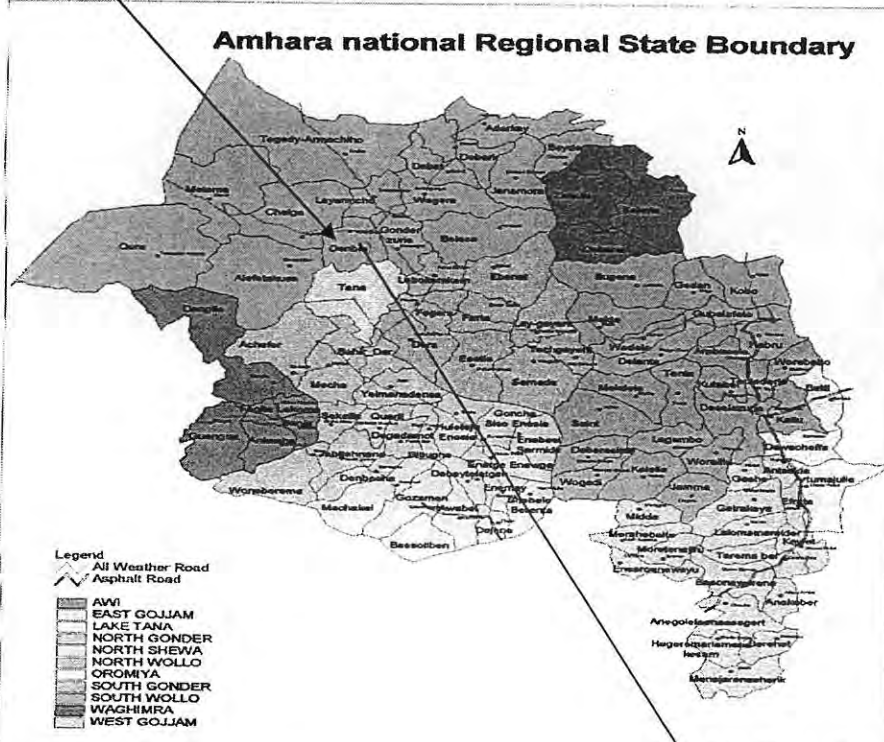
Based on figures published by the CSA in 2007, the *Dembia woreda* has an estimated total population of 307,967, in 2006 of which 155,977 are males and 151,990 are females; 30,460 or 10.15% of its population are urban dwellers, which is less than the north Gondar zone's average of 14.1%. According to the Atlas of the Ethiopian Rural Economy jointly published by IFPRI and CSA in 2007, the *woreda* has an estimated population density of 253 people per square kilometer, which is greater than the Zone average of 60.23 .Out of this total population the majority, i.e. about 90 percent, are rural residents and the average agricultural household size is about four to six persons.

The same source discloses that the proportion of agricultural households headed by women is less than 14 percent. This figure is lower than the national average that was estimated to be between 15.1 to 17.6 percent. Moreover, the dependency ratio in the *woreda* ranges between 0.98 -1.05 (*ibid*).

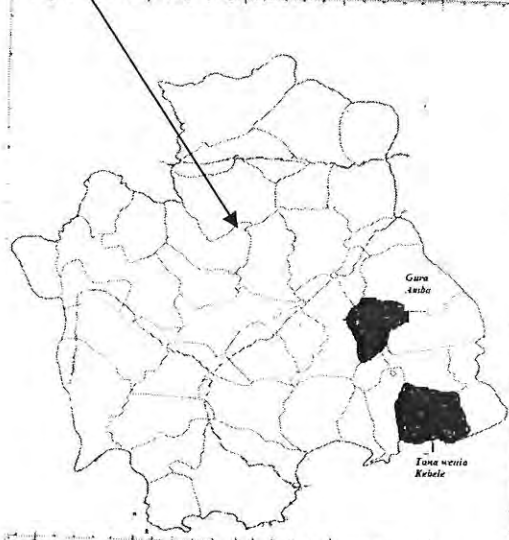
Figure 2: Map of the study area



2



3 Dembia Woreda and the study kebeles



Scale (original): 1: 250,000



Source: DPPA (2007) and *Dembia Woreda* Agricultural and rural Development Office (2006).

4.3 Altitude, Rainfall and Temperature

According to *Dembia Woreda* Agriculture and Rural Development Office (DWARO), the altitude of the *Woreda* ranges from 1850 to 2000 m.a.s.l. Therefore, it is predominantly classified as *Woinadega* ecology and the slope of the *Woreda* ranges from 2 to 4 percent. The mean annual rainfall ranges from 700 mm to 1160 mm. *Belg* and *Meher* are two cropping seasons with short and long rainy periods respectively. Farmers depend on *Meher* season rain for crop production. The average yearly minimum and maximum temperature are 18°C and 28°C respectively (DWARO, 2006).

4.4 Soil type and characteristics

The major soil type in the *woreda* is vertisol. Vertisols are black clay soils that have poor drainage capacity and it is very hard and cracks when dry and swells and becomes very plastic and sticky when wet. This often creates a problem for agricultural activities due to water logging (*ibid*).

4.5 Rivers and water bodies

According to the information obtained from the *Woreda* Agricultural and Rural development Office, the *woreda* is traversed by a number of rivers and streams such as *Megech, Derma, Abagenen, Ayenekura, Gabikura, Maqlebssa, Melkam-whea, Dahena,* and *Alqusa*. Almost all of these streams and rivers drain in to Lake *Tana* and cover around 3.2 per cent of the total area of the *Woreda*.

4.6 Infrastructure and social services

The *Woreda* has 177 km of roads in 2007/08 of which 18 km are all weather roads. There are three high schools (grade 9-10), one preparatory school, and 25 elementary schools in the *woreda*. There are eight health centers, 37 health posts and 6 animal health posts. In addition to these facilities, there are 10 farmers' training centers in the *woreda*.

4.7 Livelihood activities

The main source of livelihood in the *woreda* is crop production on subsistence basis where more than 40 percent of the total land area is held by small holders (IFPRI/CSA, 2007). *Belg* and *Meher* are the two cropping seasons with short and long rainy periods respectively. The major crops grown in the *woreda* are *teff*, finger millet and maize, which are cultivated predominantly during the wet season or *Meher*, leguminous crops including grass pea, chickpea, sunflower, lentils and various spices are also produced on residual soil moisture as secondary crops during the dry season beginning from September. **Table 1** summarizes the land use pattern in the *woreda*.

Livestock rearing is also a part of livelihood activity in the *woreda*. The *woreda* has the *Fogera* cattle breed which is well-known for its meat and milk production as well as traction power. However, owing to livestock diseases and crossbreeding with other less productive cattle breeds, farmers did not benefit much from the *Fogera* cattle.

Table 1: Land use pattern in Dembia Woreda

Type of land use	Area (Ha)	%(Share)
Arable land (Cultivable)	78,909	52
Land under cultivation	55,087	37
Pastureland	8931	6
Forest and Bush land	5955	4
Total land	148,882	100

Source: *Woreda* Agricultural Development and Information Bureau 2003, 2005 as cited in Ethiopia-Sudan power system interconnection final RAP (Resettlement Action Plan) Ethiopia, 2006.

4.8 Major livelihood problems in the *Woreda*

The major livelihood problems that were identified by the *Woreda* Agriculture and Rural Development Office include flooding, pests, weeds and livestock diseases.

Flooding is a recurrent climatic incidence in the *woreda*, particularly in the eight *kebeles* that are found closest to Lake *Tana*. According to the region's Food Security Coordination Office, the 2006/7 *kremet* flooding was the most severe and devastating affecting a total of 35,554 people in 8151 households (FSCDPO, 2007)

Table 2: Flood damage in *Dembia woreda* in two consecutive years (1998 and 1999 E.C)

Year (E.C)	Number of affected population		Flooded fields with Crops in ha	Death of People	Displaced livestock	Death of Animals	Displaced population
	Households	Family members					
1999	8151	35,574	6732.73	2	500	1058	-- --
1998	6414	----	4609.76	--	--	352	2412

Source: ANRS, Food Security Coordination and Disaster Prevention Office (2000) and ERCS (1998)

4.9 Characteristics of sample *kebeles*

Tana Weinya

According to the *Woreda* Agriculture and Rural Development Office, *Tana Weinya kebele* is one of the eight *kebeles* in the *Wereda* that are frequently affected by seasonal flooding. In fact, it is classified as the most severely affected *kebeles* in the *wereda*. The *kebele* is found 21 km from the *wereda*'s capital. It has a total population of 5963, living in 15 *gotts/villages*. It has 1545 households of which 1431 are male-headed and the rest 114 are female headed. It has a *weina-dega* ecology with a flat topography and almost zero slope. Its cropping pattern is dominated by *meher* production and the major crops that are cultivated in the *kebele* include *teff*, sorghum, maize, chickpeas, and sunflower. In addition to this, various horticultural crops mainly spices are produced in the *kebele*. The average land holding in the *kebele* is 1.4 hectare and the total cultivated land in by the end of 1999 E.C was 2265 hectares. The soil type in the *kebele* is 100 percent black clay soil with more than 1.50 cm depth. The major problems in the *kebele* are, flooding,

water-logging and the associated decline in agricultural production and scarcity of fuel wood.

Gura-amba Bata

The *kebele* is located 7km to the south of the *wereda*'s capital with a total population size of 5695 people of among this 2882 are males and 2813 are females. It has 1080 households living in 11 *gotts*. It has a *weina -dega* ecology with annual average rainfall ranging from 900 to 1400 mm. The cropping pattern is largely dominated by *teff*, sorghum, chickpeas, maize, and spices. The total land area in the *kebele* is 1950 hectares. The major problems in the *kebele* include water-logging, pests and weeds. The soil type of the *kebele* is similar with that of *Tana weinya*.

CHAPTER FIVE

FINDINGS AND DISCUSSION

5.1 Demographic characteristics and livelihood conditions of survey households

This section gives analysis and discussion of the major findings on the socio-economic characteristics and livelihood conditions of the respondents in the two studied *kebeles*. Assuming that investigating into the resilience of rural households to such natural hazards as floods and their subsequent shocks would not be complete without an examination of their socio-economic and demographic settings, this section begins with the analysis of such issues to be followed by an examination of the major components of livelihood platform in view of certain demographic characteristics and access to resources and livelihood activities.

5.1.1. Demographic characteristics of sample households

Sex, age and family Size of sample households

Sex distribution of household heads as illustrated in **Table 3** is largely dominated by males, which account for 75 percent of the sampled households. However, the proportion of female headed agricultural households is greater than the *woreda*'s figure which is less than 14 percent and the national average which ranges between 15.1%-17.6 %.(IFPRI, 2006).

Table 3: Sex of household head

Sex of household head	Frequency	Percent
male	63	75.0
women	21	25.0
Total	84	100.0

Source: Household survey, 2008

Sex of household head is largely taken as an indicator of the level of productivity and therefore vulnerability to shocks. Although there are some studies that contradict the

general assertion that female-headed households are relatively poorer and more vulnerable to shocks than households headed by men (Dejene, 1994), it is usually agreed, particularly in the case of small-holder agricultural communities, that the absence of a male labor in the household is one major factor for such households to be in a relatively disadvantaged position (Yigremew, 2001).

The age composition of the respondents indicate that out of the 82 valid cases, the overwhelming majority (95.5%) are below the age of 60, and those below 41 account half of the total respondents. The minimum age of household heads was 20 and the maximum 80. This indicates that much of the respondents are in the active age group, and are able to engage in productive activities. The number of permanent household members in the respondents' households ranged from 1 to 14 with the average household size 5.58 persons. This probably indicates the modest availability of labor in the households.

Table 4: Age distribution of respondents (N=82)

Age category	Frequency	Percent
20- 40	41	50
41-60	37	45.1
More than 61	4	4.9

Source: household survey

Marital status of the household heads influences the size, availability of resources and socio-economic status of a household. At the time of the survey, 75 percent of the respondents were married while 11 and 6 percent were divorced and remained single respectively. A gender disaggregated data on the marital status of respondents shows that all of the divorced and widowed household heads were females (**Table 5**). This seems to indicate their main reasons for being heads of households consistent with Dejene's assertion that "Women become household-heads when they are either widowed, or divorced, or when abandoned by their husbands" (Dejene, 1994:1)

Table 5: Marital status of respondents by sex of household head

Marital status		Sex of household head		Total
		Male	Female	
single	Count %	3 60.0%	2 40.0%	5 100.0%
married	Count %	60 95.2%	3 4.8%	63 100.0%
divorced	Count %	0 .0%	9 100.0%	9 100.0%
widowed	Count %	0 .0%	7 100.0%	7 100.0%
Total	Count %	63 75.0%	21 25.0%	84 100.0%

Source: Household survey 2008

As to the religion of the respondents, almost all (99%) were Christians and belong to the Amhara ethnic group.

Educational status of survey respondents: Human capital

Human capital as referring to the quantity and quality of labor available to the households in terms of its education, skills and health is crucial in determining the socio-economic status of a given household (Carney, 1988). In fact, human capital is one of the most important determinants of the livelihood strategy of a household.

Looking at the educational status of heads of sample households as one component of human capital, the findings of the survey reveals that the majority (64.3 %) of sample household heads are literate (**Table 6**). The remaining 36.7 % of the household heads are illiterate. The level of literacy among the female heads of households is found to be 23.8 percent while it was 71.4 percent for male heads of households. This shows that women's illiteracy rate is about three times higher than that of men which may indicate the

relatively poor socio-economic status of women in the study *kubeles*. The low educational status of heads of households affects their level of asset holding, livelihood activities and productivity of the household. However, educational level of other members particularly the youth cannot be simply overlooked as it affects decision making at the household level. This view is further strengthened by the field inquiry which indicated that decisions concerning the diversification of livelihood sources by engaging in trading were mostly taken by the young members of the households.

Table 6: Educational status of respondents by sex of household head

Sex of household head	Educational status of the head of the household				Total
	Illiterate	able to read and write	primary education	secondary education	
Male	15	27	17	4	63
Count					
%	23.8%	42.9%	27.0%	6.3%	100.0%
Female	15	4	1	1	21
Count					
%	71.4%	19.0%	4.8%	4.8%	100.0%
Total	30	31	18	5	84
Count					
%	35.7%	36.9%	21.4%	6.0%	100.0%

Source: Household survey, 2008

The supply of labor in the households

Labor is one of the components of human capital that directly or indirectly influences livelihood income. As indicated in **Table 7**, the supply of labor in the sampled households seems to be adequate according to the views of the majority (72.6 %) of the survey respondents. The average active labor size for sample households was found to be 3.5 persons who were able to work in 12 months prior to the survey. This indicates the availability of labor in the households as a basis for human capital formation.

The availability of labor in the households needs to be supported by good health conditions, which forms part of the human capital. With regards to the incidence of diseases in the last 12 months in the households, nearly 71 percent of the heads of the households reported that there was no incidence of severe diseases in the households. The

remaining 29 percent of the respondents reported that there was an occurrence of diseases in their households. This result may indicate that the health status of the respondents was in good condition. However, this can not rule out the possibility of incidences of certain sicknesses and chronic illnesses such as TB (tuberculosis) and HIV/AIDS that debilitate the labor capacity of members of households. Moreover, participants in the FGDs and key informant interviews repeatedly mentioned lathyrism that results from the consumption of *guaya* (grass pea or vetch) as a cause of disability that reduces the working capacity of people in the study *kebeles*.

Table: 7. Supply of labor and incidence of illness in the household in the last 12 months

1	The availability of labor in the household	Frequency	Percent
	More than adequate	7	8.3
	Adequate	61	72.6
	Not adequate	16	19.0
	Total	84	100.0
2	Incidence of illness in the household in the last 12 months?	Frequency	Percent
	Yes	24	28.6
	No	60	71.4
	Total	84	100.0

Source; household Survey data, 2008

5.1.2 Access to resources and livelihood

Livelihood of rural households largely depends on access to resources. Access to resources indicates wealth-status and determines the type of livelihood strategies employed by households. These form the capital needed to pursue sustainable livelihoods

(Scoones, 1998). Hence, access to resources as a major factor that determines the livelihood of people is discussed in this section.

5.1.2.1 Major asset endowments of survey households

(a) Natural Capital: Land

Natural capital is usually referred to as environmental resources that provide services vital to livelihoods (Scoones, 1998). It comprises a range of resources including land, water, forests, wildlife and other environmental and biological resources. Land is the major determinant of the asset status of rural households and plays a strategic role in determining their livelihood security.

Data from the household survey show that the majority (96.4%) of the respondents reported having some arable land (**Table 8**). The farmland holdings of the sampled households range from 0.5 to 2.5 hectares. The average land holding size was 1.36 ha and most households (57.14 %) have land holding sizes between 1 and 2 hectares (**Table 9**). These figures approximate the figures obtained from the *wereda* Agriculture and Rural Development Office which puts the average landholding size at 1.4 hectare with the maximum 3 and minimum 0.5 hectares.

Table 8: Land ownership of sample household heads

Do you or any other member of your household own land?	Frequency	Percent
yes	81	96.4
no	3	3.6
Total	84	100.0

Source: survey household, 2008

The actual size of farmland cultivated during the last farming season, however ranged from 0.5 to 4 hectares of land for the sample of households. This indicates the practice of obtaining farm lands through sharecropping, rents or other forms arrangements. This

finding agrees with other studies in which farmers were found to obtain land for cultivation through various arrangements (Sharp, Devereux & Yared, 2003).

Table 9: Size of Land Owned

Size of landholding per household	Number of Respondents	Percent
Less than 0.5 ha	12	14.28
Between 0.5 and 1.0 ha	18	21.42
Between 1.0 and 2.0 ha	48	57.14
Between 2.0 and 2.5 ha	6	7.14
Total	84	100.00
Average land holding size	1.36ha	

Source: Household survey, 2008

In order to shed light on the problem of land fragmentation, the respondents were asked to identify the number of plots they own and as can be observed from **Table 10** below, the number of plots a household owns ranges from 1 to 3. Half of the surveyed households reported having 2 plots of land. With regards to change in the size of land holding, 25 percent and 70.3 percent of the respondents reported a decrease and no change in land holdings in the past ten years respectively. These results closely approximate other statistical reports on land fragmentation on the *woreda* which gives a figure ranging from 2.6 to 3.2 as the number of plots per holding. (IFPRI/CSA, 2006). However, results from FGDs in both *Kebeles* indicate the existence of land fragmentation and decrease in the size of land holdings. Population pressure loss of fertility of farm lands, damage on land as a result of flooding, intra-household redistribution of land were among some of the reasons mentioned for the fragmentation of farm lands during the discussions.

Table 10: Number of plots of farmlands respondents own

Number of plots	Frequency	Percent
1	39	46.4
2	43	51.2
3	2	2.4
Total	84	100.0

Source: household survey, 2008

Moreover, almost all of the FGDs participants and key informants in both *kebeles* mentioned land ownership as an important indicator of the level of well-being of a household. In the study *kebeles* it was also noted that people with no or little land are often the poorest of the poor. In this regard, women headed households in the study *kebeles* were particularly mentioned to have small plots of farm lands. The finding of the household survey also confirms this assertion. For instance, **Table 11** gives a cross tabulation of sex of household heads with the size of landholdings in which the majority 13(27.1%) of the female household heads have landholdings sizes between 1.0 and 2.0 hectares in contrast to 72.9 percent of their male counterparts. This situation corroborates with the findings of previous studies that indicate female-headed rural households have limited access to land as compared to male headed households (Dejene, 1994). This situation is more amplified when we look at the farmland cultivated during the last farming season by households. In this regard, focus group discussants in both *kebeles* stated that female-headed households and households with a possession of less than two *kada*² of farmland are less likely to cultivate their own land and are often forced to either sharecrop or rent them out since they lack some resources such as labor and oxen or the land is too small to cultivate.

² *kada* is the local unit of measurement for farmlands. It is the same as *timad*, which refers to the size of farmland that can be ploughed by a pair of oxen in one day. Four *kada/timad* is equivalent to one hectare.

In sum, the results of household survey, FGDs and key informant interviews indicate that although the majority of households included in the study have access to farmlands, the problem of fragmentation and lack of sufficient farmlands were largely found to limit the productivity of the households. This corroborates with the findings and arguments of previous studies which indicate that “the sufficient control of land is a prerequisite for a viable livelihood” (Yared, 2002:52).

Table 11: Size of farmland by sex of household head

Size of land owned by the household including fallow lands	Sex of household head		Total
	male	female	
Less than 0.5 hectare	8 66.7%	4 33.3%	12 100.0%
Between 0.5 and 1.0 hectare	15 83.3%	3 16.7%	18 100.0%
Between 1.0 and 2.0 hectare	35 72.9%	13 27.1%	48 100.0%
Between 2.0 and 2.5 hectare	5 83.3%	1 16.7%	6 100.0%
Total	63 75.0%	21 25.0%	84 100.0%

Source: household survey, 2008

(b) Physical Capital: household asset profile

Physical capital refers to assets that are created by the economic production processes, which can also be used as inputs in the same process. The identification of assets possessed by the rural poor is therefore crucial in the understanding of their livelihood. Asset identification needs to be emphasized in studying the impacts of hazards such as flooding on livelihoods where asset holding is a critical in which household resilience and livelihood security largely depend (Carney, 1998). Therefore, a select range of assets possessed by the sampled households is discussed in this section.

(i) Livestock

Livestock are one type of asset identified by sample households in the study *kebeles*. Following Sharp, Devereux and Yared (2003), three indicators were used to analyze livestock as a household asset these were (1) total number of livestock owned (2) access to draft power (3) the number of oxen owned. In view this, results from the household survey indicated that most (89%) of the households own some type of livestock. Similarly, 88.1 percent of the household heads reported having access to draft animal (**Table 12**) and the figure for oxen owned by the sampled households indicates that 11.9 percent of the households lack such a critical asset in their households. This indicates that such households are likely to be in relatively disadvantaged position in the face of livelihood shocks as they lack such a critical asset that is highly needed in farming system. Moreover, the lack of ownership of oxen can be used as a proxy indicator of the level of well-being of a household and its vulnerability to the effects of environmental hazards such as flooding as it is often interpreted as a sign of destitution and vulnerability (Sharp, Devereux & Yared, 2003).

The qualitative field inquiry also confirmed such assertion. In this regard, the participants of FGDs repeatedly mentioned the lack of oxen by a household as a sign of poverty and vulnerability to naturally induced shocks. For instance, some participants expressed the values of an ox as follows:

...a farmer with out an ox can be said to live in poverty as he often faces challenges in feeding his family. He is forced to work on someone's farm for wages if his farmland is small. In fact, a farmer that has one ox is better off than a farmer with no ox, since the former can plough his own land by pairing his ox with his friend's through mekenajo.

The participants indicated some ways of access to draft power, including renting in and free use of animals through a special arrangement called "asana giber" where friends and neighbors lend their oxen for farmers who have no access to draft animals. However, the participants claimed that the practice has recently become infrequent owing to the dwindling stock of cattle in the *kebeles* caused by animal diseases and shortage of grazing lands.

Table 12: Availability of draft animal or a pair of oxen for farming

Do you or any member of your household own farm oxen?	Frequency	Percent
yes	74	88.1
no	10	11.9
Total	84	100.0

Source: household survey, 2008

(ii) Access to social services

Access to basic social services play a major role in either accelerating or retarding recovery from the effects of natural hazards. In terms of access to social services such as roads, markets, schools, potable water and health posts, only 21.4 percent of the sample heads of households reported having access to all of the services. The interview made with key informants also confirmed the lack of access to basic infrastructural services such as an all-weather roads, schools, health posts and potable water in the *wereda*.

(c) Social Capital

According to Scoones (1998), social capital refers to “the social resources” upon which people draw in pursuit of their livelihood objectives. Participation or membership in local institutions is taken as a proxy to measure the level of social capital of households in the study *kebeles*. And as indicated in **Table 13** below, most surveyed household heads (88.1%) participate in kind of mutual labor exchange festive called *debiat* in the study *kebeles*. However, the popular institutions of *Iddir* and *Iquib* were not found in the study *kebles* and still remain part of an urban experience in the *woreda*. According to some informants, this is because of the existence of kin relations among most of the village/gott dwellers in the *kebeles* that help each other at times of crisis such as death.

Other major social capital sources were also identified in the FGDs and key-informant interviews. These include remittances from relatives and mutual supports through some

local traditional arrangements such as ‘assana geber’ in which members of a particular gott help each other in agricultural activities such as weeding, tilling, and trashing in the event of shortage of labor, ill-health or old-age. *Debiet* is also another form of mutual reciprocal support in which neighbors help on another in agricultural activities. Church groups (*maheber* or *senbete*) are also another source of social capital, where households participate in the study area. During the FGDs it was mentioned that these groups are used as a medium of reconciliation and conflict resolving mechanisms.

Table 13: Participation in festive work groups or in 'debo/debaet'

Participation	Frequency	Percent
yes	74	88.1
No	10	11.9
Total	84	100.0

Source: household survey

The level of participation of households in social institutions in the study area was reported to be declining by the participants of FGDs. Results from the questionnaire survey indicated that 11.2 percent of respondents do not belong to any social institutions at the time of the study and a further 23.7 percent of the respondents belonged to only one institution. This result seems to indicate that households who tend to participate in fewer social institutions are likely to be more vulnerable and less resilient to the effects of shocks induced by flooding. Other studies also indicate the same trend. For instance, a study made on destitution in Northeast Ethiopia, by Sharp, Devereux and Yared (2003) shows that the most of the destitute households “tend to participate in fewer social institutions than other households, which increases their vulnerability since they are unable to call on fellow members of those institutions for support” (Sharp, Devereux & Yared, 2003: 61).

5.1.2.2 Activities and livelihood

Livelihood assets, access to them as shaped by peoples' socio-economic positions and institutions determine the specific livelihood strategies and activities of people. This in turn forms the livelihood system that provide people with "layers of resilience" to cope with various disturbances (Glavovic, Scheyvens and Overton, 2003). Livelihood activities are part of the livelihood strategies that generate the means of household survival. Therefore, different categories of activities and incomes generated from them are examined in this section.

Livelihood activities and of respondents

Livelihood activities pursued by households in the study area can be categorized in to the following main and subsidiary activities (1) agriculture (crop production, and livelihood rearing) (2) casual wage labor (off-farm and on-farm) (3) trade. In addition to these activities, households also earn incomes from remittances received from household members or relatives working in towns like Humara, Gondar and Bahir Dar.

Results from the household survey, indicated that households combine various livelihood activities and avoid relying on a single source of income. This clearly indicates that households use some kind of diversification as a livelihood strategy, with the view of enhancing their livelihood security (Ellis, 2000). In this regard, cultivation of crops is pursued as a primary livelihood activity by almost all (95 %) of the respondents (**Table 14**). However, the most striking observation is that households tend to combine this primary livelihood activity with other subsidiary activities as attested by the fact that only 1.2 percent of the respondents pursue crop production as the only livelihood activity.

A large proportion of the sample heads of households (96.4%) reported that they combine crop production and livestock rearing as major livelihood income sources. Conversely, those household heads that combine trade as an income source constitute only 15.4 percent of the total households. A further investigation in to the diversification strategy of households also showed that only 6 percent of the respondents participate in non-farm

activities such as wage labor and handicrafts making. These results illustrate that most of the respondents depend on farming and farm-related activities and non-farm employment opportunities in the study *kebeles* were largely limited. Through focus group discussions and individual interviews distance from towns, market centers, lack of credit, lack of business skills and negative traditional outlooks were identified as the major bottlenecks that limit the participation of people in off-farm activities.

This seems to indicate that non-farm diversification as a risk avoiding strategy in the study *kebeles* needs to be encouraged by way of opening gates of opportunities to pursuing non-farm activities. Various studies have also indicated that rural households that draw a significant share of their income from such activities tend to have a better chance of avoiding livelihood shocks resulting from natural causes (e.g. Belaineh, 2003; Galab *et al.*, 2003; Sharp, Devereux & Yared, 2003).

Similar observations were noted by Yared (2002) who found out that the lack of non-agricultural activities and farmers' reliance on coping with one-time regular shocks through distress-induced sale of certain assets exposed them to vulnerability through asset dwindling. Similarly, Galab *et al* (2003) based on findings from their study in India argue that households engaged in non-farm diversification activities tend to be richer and less vulnerable to the effects of shocks.

Table 14: Distribution of respondents by type of livelihood activity and number of activities pursued

Types of livelihood activities	Frequency	Percent	Number of activities		
			Frequency	Percent	
Mixed farming (Crop production & Livestock rearing)	81	96.43	1	1	1.2
			2	4	4.76
Trade	1	1.2	3	44	52.4
Wage labor	2	2.33	4	35	41.7
Total	84	100.00	Total	84	100.00

Source: household survey, 2008

With regards to the number of activities, as can be shown from **Table 14**, 52.4 percent of the surveyed households were found to be engaged in three livelihood activities while 41.7 percent of all the households were pursuing four activities which were all related to agriculture such as animal husbandry, poultry, cereal production and horticultures. On the contrary, none of the respondents were found to be engaged in any off-farm activity as a sole source of income. These results were also endorsed by the participants FGDs and key informant interviews. For instance, while the majority of the FGDs participants noted that both male and female-headed households engage themselves in wage labor in either farm or non-farm activities, some highlighted that women headed households largely engage in petty trading such as in the selling of 'katikala'.

5.2. The nature of flooding and effects on livelihoods

Natural hazards such as floods and droughts often expose poor communities to vulnerabilities that can be investigated from two dimensions (1) external dimensions or vulnerability context which can be expressed as the exposure to circumstances beyond people's control, including shocks, trends and seasonality (2) internal dimensions which refers mainly to socio-economic systems, access and use of resources to the extent to which peoples' livelihood is affected by the exposure to external factors (IFRCS, 2007; Blaikie, *et al.*, 1994).

In view of this therefore, the nature of flooding in the study *wereda* in terms of its cause, magnitude, severity, frequency and duration is discussed as a major component of the vulnerability context of people in the study area. Along side this, by drawing together the findings from the household survey, the FGDs and the interviews with key informants on the effects of flooding on the livelihoods of people is discussed with the perceptions of people towards flooding as a livelihood threat.

5.2.1 The nature of flooding in the study area

Flooding in *Dembia woreda* is a seasonal phenomenon as the *woreda* is situated bordering to Lake *Tanna*. Several rivers that spring from neighboring *woredas* drain into Lake *Tanna* traversing the *woreda*. According to the information obtained from the *wereda* Disasters Prevention and Preparedness Desk, the major cause of flooding in the area can be attributed to the over-flow of rivers during the rainy seasons. Five major rivers namely *Megech*, *Derema*, *Nededit*, *Gumara* and *Senzelit* were identified by the *woreda* officials and experts as causing major floods in the two study *kebeles*. According to them, these rivers have their peak flows in the main rainy season starting from July through August and only show decreases in their volume in late September. As a result, they regularly inundate the adjacent plains by overtopping their banks in eight *kebeles*.

During the discussions, it was also indicated that normal flooding happen all the time in the study area, however, some severe floods have occurred in the past that are associated

with heavy rainfall in the highlands. For instance, the floods of 1988/89 E.C and 1994 E.C and 1998 were mentioned by the discussants as the most severe floods that hit the area. Secondary records obtained from DPPA also show that severe flood occurred much earlier in 1966/67 and 1974/75 in the *Woreda* (DPPC, 1997).

A change in the severity of floods was also noted by experts and other study participants. People felt that flooding is more severe and frequent than in the past. Most of them came to understand that the population pressure and the associated farmland expansion have brought people close to the rivers which made them more vulnerable to flooding. This seems to agree with the major assertion in the literature which relates the cause of peoples' vulnerability to their socio-economic and contextual factors rather than to mere exposure to floods (Cannon, 2000; Handmer, 2003).

In contrast, some participants stated that rivers have begun inundating farm lands and villages by changing their natural courses. For instance, one expert mentioned *Megech* River as one of such rivers that have changed its natural course since the 1998 flooding. The river (*Megech*) is now flowing in a new channel which is too narrow and shallow, causing the river to meander and spread out onto the plains easily overflowing its bank, flooding several villages in *Tana Weina kebele*.

Two points stand out from the above findings, (1) riverine flooding is the major type of flood in the study area (2) the nature of the flooding in the area is showing a marked change in terms of its severity having major consequences on the lives and livelihoods of people in the area.

Other factors that contribute to and aggravate the flooding in the area were also revealed by FGDs and key informant interviews. The soil type of the *Woreda* was mentioned as one such factor. According to informants from the *Woreda* Agriculture and Rural Development Office, the black clay soil [which is the dominant soil type in the *Woreda*] aggravates flooding as it is poor in its drainage capacity and gets saturated and sticky with even a small amount of rainfall. It also fails to absorb additional water flowing from rivers, contributing to flooding and water logging.

Although the nature of the watershed and soil type in the area can be mentioned as factors that influence the occurrence of flooding in the *Wereda*, it is hardly possible to attribute the cause and the occurrence of flooding only to these factors. In fact, all of the *Wereda* agricultural experts interviewed about the cause of flooding mentioned that flooding in the *Woreda* is partly attributable to the following human activities that played a greater role in determining flood damage.

1. Deforestation: This made the highlands barren by exposing the top soil to heavy erosion and increasing the run-off of rain water from these areas to low areas. Periodic changes in the amount and intensity of rainfall aided by the lack of vegetation cover in the highlands also help in aggravating the run-off and the flooding in the study area.
2. Traditional and backward cultivation system in the highlands was mentioned as a factor that causes and accentuates the rate of soil erosion and run-off in the study area. According to the opinions of the *woreda* Agriculture and Rural Development experts, some irresponsible local farming practices such as tilling hilly lands have increased the problem of run-off and thereby contributed to increased flooding in low lying areas.
3. During discussions held with both experts and officials of the *woreda*, the lack of integrated conservation activities and watershed management was also mentioned as contributing factor for the rise in the frequency of flooding as well as the increasing human vulnerability in the area.

In general, the *woreda*'s geographic location, topography and soil type aggravated by the effects of human intervention such as deforestation, traditional cultivation practices and lack of sustainable water-shed measures were found to cause or exacerbate flooding in the study *kebeles*.

The magnitude, frequency and duration of flooding in the *Wereda*

The existing literature on flood disasters indicates that magnitude of the flooding along with its frequency and duration is an important factor that determines the rate at which

flood risk/hazard turn into a disaster (UN, 1997). In view of this therefore, the study attempted to look into the magnitude of flooding in the study *kebeles* in the recent past by establishing some indicators such as the increase in the size of land covered by flooding and the extent and severity of damages caused by flooding. Likewise, the duration of flooding in the study area was indicated by the number of weeks or months flood water stayed in the villages and the relative depth of flood water as measured in centimeters. The findings of the study indicated that there was an increase in the degree and frequency of flooding in the *wereda*.

In this regard, results from the household survey indicated that most respondents (97.6%) reported that the magnitude of flooding increased over the past five years. Similarly, 77.4 percent of the survey respondents agree with the opinion that the frequency of flood disasters has shown an increase in the last five years (**Table 15**). The same is true for the duration of flooding, in which the majority (73.8%) of the respondents reported an increase in the duration of flooding in the study *kebeles* in the last five years (**Table 16**).

The results from the qualitative inquiry also indicated increasing trends in the magnitude, frequency and duration of flooding in the study *kebeles*. Most informants indicated that the magnitude of flooding increasing since 1998 with increasing adverse effects on people's lives and livelihoods. When asked about the cause of the severity of flooding, they mentioned the increased overflow of river *Megech* coupled with the back flow of Lake *Tanna* during the rainy seasons. Experts from the *wereda* Agriculture and Rural Development Office also mentioned that the heavy mountain deforestation in the neighboring *weredas* as a factor that causes run-off. In addition to this, the rivers *Megech* and *Derma* are filled with silts coming from uplands which reduced their depth and width. This has led to the seasonal overflow of water from their banks inundating some 6,000 hectares of land in eight *kebeles* in the *wereda*. Such sediment accumulation in the river beds was taken as a factor that increased flood levels.

Table 15: The severity of flood disasters in the past five years

The severity of flood disasters in the past 5 years	Frequency	Percent
Increased	82	97.6
decreased	2	2.4
Total	84	100.0

Source: household survey, 2008

With regards to the duration of flooding, the participants of FGDs and informants disclosed that flood waters stay in the area for a maximum of three months starting from mid-July to mid-September. The FGDs participants also stated that during normal floods water stay for about three weeks on farmlands and homesteads. However, as one of the discussants revealed “...*this has become a thing of the past, when we used to take advantage of the floods, that used to provide us with fertile soil.*”

In relation to the depth of flood waters, experts from the *woreda* Agriculture and Rural Development Office stated that flood water depth has been showing an increase with estimated average increase of 50 cm. According to them, the depth of flood waters used to be 100 cm on average, with the maximum possible depth of 150 cm, which is the peak depth reached by the 2006 *kerment* flooding.

Table 16: The duration of flood disasters in the past five years

The duration of the flooding in the past five years	Frequency	Percent
Increased	62	73.8
Decreased	15	17.9
Showed no change	4	4.8
don't know	3	3.6
Total	84	100.0

Source: household survey, 2008.

In sum, the results obtained from the questionnaire survey and the qualitative field inquiries showed that flooding is becoming more frequent, intense, and severe. This result is also confirmed by secondary data obtained from the region's Food Security Program Coordination and Disaster Prevention Office, which compares the recent two years flooding and their effects in the region (Table 17).

Table 17: Comparison of flood disasters in two consecutive years in ANRS

Year E.C	Rainfall duration	Affected <i>woredas</i>	Affected population	Crop damage in hectares	People in temporary shelters
1998	Early June to end of August(3months)	14	130,008	20,010	39,897
1999	Early June to end of September(4 months)	19	133,295	34,112	11,802

Source: ANRS, Food Security Program Coordination and Disaster Prevention Office (FSCDPO), 2007

5.2.2 Effects of flood-disasters on livelihood

The effects of flooding on people and their livelihood are shaped by the perception of the flood disaster/risk and the vulnerability of their livelihood system (Blaikie, et al., 1994). This general notion mirrors the findings of the current study in which many of the respondents clearly stated an increase in the occurrence of flood disasters and related shocks associated with a continuous decline in their possession of assets and increasing level of poverty. The details of the findings are conveyed in the following sub-section

5.2.2.1 Perceptions of the local people towards flooding

According to the results of the household survey, around 95 percent of the respondents reported that they perceive flooding and its associated consequences such as water logging as a major threat to their livelihood (Table 18).

The interviews and FGDs made with farmers in the two *kebeles* also confirmed the results obtained from the survey respondents in which a range of views were expressed about flooding during the FGDs and interviews with informants. Most participants mentioned flooding as a major livelihood problem particularly in the recent decade. According to them, the 2006/7 *Kremet* flooding had had unprecedented impacts on their livelihoods only to be compared to the flooding of 1998.

However, the perceptions of future flooding risks were found to differ among participants. For instance, some participants of FGDs held in *Tana Weina kebele* revealed that the risks of flooding largely depends on the proximity of a homestead or farmland to the rivers *Megech* and *Deerma*. This seems to indicate that households that are close to flood hazards and who have been flooded in the past are more likely to perceive flooding as a risk, than those who are far away from the flood plains. These results are broadly in agreement with a study on community perceptions and responses to Awash floods undertaken by Lemma (2003).

Table 18: Perceptions on flooding as a livelihood problem

Do you perceive flooding as a major livelihood problem?	Frequency	Percent
Yes	80	95.2
No	4	4.8
Total	84	100.0

Source: household survey, 2008

Although, there is a general perception that flooding has a negative impact on livelihoods, some informants mentioned the advantages of floods in supplying farmlands with alluvial soil. This is perceived to increase the productivity of farmers together with the residual moisture left in the soil by the receding flood waters that help to grow secondary crops in September and October. However, according to officials and experts

from the *Woreda* Agriculture and Rural Development Office, such advantages of the of flooding are fading away as the frequency and severity of the flooding increased, coupled with the problem of sedimentation which results in the loss of large tracts of farmlands already pressed by the increasing population number in the area. Besides, during interviews with the *woreda* experts and farmers, it was mentioned that the recent floods in the area are bringing rocks, sands and other debris instead of the usual alluvial soil as the top soil in the highlands has already been washed out by years of continuous erosion. In view of this, one expert said: “*there is no more soil to be brought by floods, as the highlands have already devoid of the top soil in earlier erosions, only rocks and sands remained in the highlands*”.

In sum, the results of the survey, FGDs and interviews all indicate that recurrent flooding is perceived as the main natural hazard that is becoming a threat to livelihoods in the study area. This in turn reflects the common experiences of flood-hazards that persisted for years in the study *kebeles*. This is expected to erode the resilience of households and increase their level of vulnerability.

5.2.2.2 Effects of flood disaster on livelihoods

Flooding has been affecting the study *kebeles* for years. According to the DWARO, the study *kebeles* experienced one of the worst floods in 1994 caused by the heavy rainfall in the highlands that increased the volume of Lake *Tanna* and the tributary rivers sending huge amounts of water into the nearby plains and beyond. As a result, thousands have lost their assets and were dislocated from their homesteads. Flooding has been showing an increase in its intensity in the flood prone *kebeles* since 1994 particularly after river *Megech* has changed its course and started flowing in a shallow bank crossing major settlement areas, farm and grazing lands. The following discussion gives a description of the effects of flood disasters in the study area.

1. Economic consequences

Flood disasters often affect the economy of rural households as they depend on agriculture as a means of subsistence. Results from the household survey and the various

qualitative interviews and FGDs indicate that regular flooding in the study kebeles cause frequent economic losses to households. The following are some of the economic consequences of flooding, as mentioned by households in the studied *kebeles*.

(a) Damage to crops

The findings from the household survey indicate that crop damage is most common type of economic loss experienced by households in the study *kebeles*. Accordingly, most (64%) of the respondents reported that they have lost various types of crops to flooding. Through the problem ranking and scoring exercises, participants of the FGDs also indicated that crop damage is the foremost impact of flooding in economic terms. The loss of standing crops such as *teff* was substantial during the floods in 2006. During the FGDs in both *kebeles*, it was noted that farmers were compelled to change the cropping pattern from *teff* and wheat in to finger millet and in recent years. In addition, almost all participants and key informants indicated that farmers in the study kebeles have begun to rely more on secondary crops such as chick-peas, field peas, and faba beans and other leguminous crops which grow by using the residual moisture left in the soil in the dry seasons. However, the overall production of cereals and pulses has gone down in recent years owing to the loss of soil fertility as a result of sedimentation which creates suffocation to such crops. In addition, the humidity of the soil resulting from flooding creates a favorable condition for pests such as Cut Worm (*Agnotis Segetum*) that reduces the productivity of the crops. In relation to this, one of the participants of FGDs in *Tanna weiena kebele* disclosed that:

...flooding is making the cultivation of crops a challenging task. During the rainy season, it washes away crops that we grow spending so much labor and time and when we plant secondary crops, Korache [Cut-worm] destroys it.

The loss of primary crops and the declining productivity of secondary crops suggest that exposure to food insecurity is inevitable for the affected households. The effect of flooding on the food security of households is also amplified by the loss of production as a result of the time spent on recovery and rehabilitation in the aftermath of the flooding. Flooding has also increased the vulnerability of households to food insecurity as attested

by the increasing relief grain requests made by the *Woreda* Agricultural and Rural Development Office (see **Annex I**).

Results from studies on the effects of floods in other countries indicate similar cases. For instance, the International Food Policy Research Institute (IFPRI) in its study on the 1998 floods in Bangladesh finds that “In most cases farmers couldn’t plant their usual crops and did not have enough fodder to feed their livestock.” (IFPRI, 2001: 80).

Table 19: Loss of crops on farms due to flooding in the past 12 months

Did you experience loss of crops on your farms in the past 12 months?	Frequency	Percent
Yes	83	98.8
No	1	1.2
Total	84	100.0

Source: household survey, 2008

(b) Damages on farm and grazing lands

Damages on farm lands as a result of silt deposition were noted by 48.7 percent of the respondents of the survey questionnaire. The participants of FGDs have also indicated that the recent increase in the frequency and intensity of seasonal flooding, particularly of the floods 2006 *Kremet* season inundated several tracts of farming and grazing lands which were made unusable as they are largely covered with rocks and debris. In this regard, secondary data obtained from the *Woreda* Agriculture Rural Development Office indicated that on average 6,000 hectares of land in eight *kebeles* are subject to flooding in the rainy season. The damage to farm and grazing lands compounded by the aftermath effects of the loss of productivity and animal diseases, result in the loss of physical assets of households.

The damages on farm and grazing lands were also observed to continue after the receding of the flood waters. The grazing lands will be covered by weeds that are brought by the flood waters from other areas destroying the natural grass and exposing livestock to starvation.

(c) Loss of physical and other assets

In addition to the losses to crops, flooding caused damages to houses and household assets. In this regard the data obtained from the household survey indicated that 77.4 percent of the respondents suffered damage or loss of housing in the past five years. The loss of livestock, which is considered as a major physical asset in the study *kebeles*, is also reported by 28.6 percent of the respondents (**Table 20**).

The relatively small percentage of responses on the loss of livestock could probably be explained by the fact that households take precautionary measures such as sending their cattle to higher grounds. The findings from the FGDs also indicated that since the loss of livestock, particularly oxen means a major loss to a household, farmers send their cattle to other *kebeles* situated on higher grounds. These findings agree with other studies that show the damage of flooding on the livelihood assets of rural households. For instance, a research carried out by the International Food Policy Research Institute (IFPRI) on the effects of the 1998 floods in Bangladesh shows that 55 percent of the 757 sampled households lost critical assets IFPRI (2001). In general, such losses reduce the asset base of households, decrease their productivity and weaken their coping capacity as it reduces their buffer stock.

Table 20: Incidence of damage on housing and property in the past due to flooding and Loss of livestock as a result of flood disasters in the past 12 months

damage on housing and property in the past due to flooding	Frequency	Percent
yes	65	77.4
no	19	22.6
Total	84	100.0
Loss of livestock as a result of flood disasters in the past 12 months	Frequency	Percent
Yes	24	28.6
No	60	71.4
Total	84	100.0

Source: household survey, 2008.

(d) Damages on rural infrastructures

Flooding in the study kebeles, has caused damages to the already insufficient and overstrained public infrastructure. According to the participants of FGDs and Key informants, (which was also confirmed by observation) one health center which used to provide services for *Tanna Weinea kebele* was put out of use as a result of flood damage on the building and the health workers were relocated to a remote *kebele*.

Two blocks of a junior elementary school were also observed being submerged in silt deposits. Informants also noted that some school age children were left out of school until other replacement blocks were constructed recently. Moreover, the flooding in the study *kebeles* disrupted transportation and often delays the provision of emergency relief to households affected by flooding; access to market services is also blocked for the entire rainy season. One informant recalled the extent of the problem caused by the flooding of

2006 *krement* season as follows: “gorfu mengeste wedegna metteto endayredane weye engnna aendamenkesakese asron yale kefu balagarachen neaw” which loosely translates conveys the idea that flooding is the worst adversary to the livelihood of farmers as it often made the roads impassable to both the farmers and aid agencies that seek to provide relief to the affected *kebeles*, particularly in times of severe flooding like that of 2006. Similarly, experts from the *Woreda* indicated that during severe flooding, the study *kebeles* are only accessed by boats from Lake *Tanna*. This delayed relief and evacuation operations as it required several days to supply the amount of logistics needed, which otherwise would have been supplied within a short period of time if access by land was not blocked.

The problem ranking and scoring exercises made with FGDs participants have also revealed that crop damage was the far most effect of flooding followed by damages on farm and grazing lands, loss of livestock, exposure to diseases, damage on housing and property and disruption of social services.

In sum, flooding caused great economic losses to households in the study *kebeles* by damaging crops standing in the fields and by destroying key productive assets such as land. This in turn caused the loss of production and productivity for the households which are likely to be more vulnerable to other shocks such as food insecurity. The damage on rural infrastructures further worsens the loss of household's income as it blocks access to market and wage labor. It also forces members of a household to spend more time on recovery and rehabilitation of their damaged farmlands and houses than on production. All these eventually make households less resilient and more vulnerable to future shocks and jeopardize their livelihood.

2. Social consequences of floods

Certain social consequences of flooding have become evident from the findings of the study. Participants of the FGDs and key informants in the study *kebeles*, have disclosed that the disruption of normal life in the case of dislocation as a major social consequences

of flooding. The following are some of the social consequences of flood disasters in the study *kebeles* as mentioned by participants of FGDs and key informants.

(a) Loss of life: Loss of human life was not reported in the household survey. The participants of FGDs and informants have also indicated that flood-induced deaths were infrequent. These findings were also confirmed by secondary data obtained from the *Woreda* which indicates that there were only two incidents of flood related deaths in the study *kebeles*. The few flood related deaths can probably be explained by the fact that the flooding in the *woreda* was not a result of flash floods that are characterized by rapid onsets giving short time for people to escape from the hazard.

(b) Conflict and displacement: Most participants of FGDs repeatedly stated that the recurrent flooding in the study *kebeles* intensified conflicts among households. According to them, such conflicts are often triggered by flood damages on the boundary marks that exist between bordering farm lands.

Migration in search of wage labor as induced by flood damages on critical livelihood assets such as farm lands and livestock was also noted by FGDs participants and key informants as creating social problems in the study *kebeles*. According to them, during severe flooding, men who have lost crops and livestock, migrate to places like *Humera* in search of wage labor to supplement their household income until the flood water recedes. This, as indicated by some informants, overburdens the women as they assume the headship of the household during such hard times. The loss of household assets and the resulting migration to towns was therefore, indicated as a contributing factor for family breakdown and divorces. One participant of FGD in *Gura Amba kebele*, who was abandoned by her husband two years ago, explained that:

during that time [two years before] we have lost all of our crops planted on 5 kada of land to floods, 12 sheep and goats and several chickens. After that, my husband went to Humera to work on sesame farm and I haven't seen him ever since. I am now struggling to bring up three children by myself.

These findings seem to indicate that women suffer the most in the post-disaster or recovery phases. Sharp, Devereux and Yared (2003) have come with the same assertion in their destitution study in *Wello*.

Participants of the FGDs have also stated that conflict over grazing land with neighboring *woredas* has become frequent. According to them this is related to the scarcity of grazing lands in the neighboring communities as more and more of the grazing land was used for farming as a result of which the custom of sending cattle to these neighboring *woredas* during the rainy seasons was met with fierce resistance. Some informants have also conveyed their fear that the frequent flood disasters could kill off the working spirit of farmers as more of them expect aid from government and aid agencies. These respondents' opinions were corroborated by *woreda* officials and experts.

(c)Exposure to epidemics and related health hazards: The fact that flooding brings health risks is well established in the literature (IFFRI, 2001). This fact is also reflected in the findings of the study in which 67.9 percent of sampled household heads reported exposure to various diseases as a result of flooding in the 12 months prior to the survey. Similarly, the qualitative data obtained from FGDs, and interviews indicated that most households were exposed to water-borne and vector-borne diseases such as Typhoid, Acute Watery Diarrhea (AWD) and Malaria. According to experts from the *woreda* health office, these health risks on people had reached to the level of outbreaks in 2006(in the case of AWD) in the *kebeles* as a result of water contamination and lack of sanitary precautions. In view of this one informant said: "during the rainy season, people are forced to drink flood waters that are contaminated with various impurities"

This view was further supported by secondary data obtained from the *Woreda* health office and DPPA, in which recurrent Acute Watery Diarrhea (AWD) outbreaks were reported following the 2006 *krement* flooding. The number of AWD cases reported in 2007 was 188.

Almost all participants of the FGDs mentioned an increase in the occurrences of livestock diseases in the *kebeles* associated with the increasing frequency of flooding. According to them, some livestock epidemics which were unknown previously are now affecting their cattle. However, most of the discussants failed to provide logical explanations on the relationship between increasing livestock epidemics and flooding. And quite a few of the FGDs participants were able to come up with somewhat plausible explanations that show the possible effects of flooding on livestock health. Some of these explanations shed light on how flooding creates a favorable conditions for the spread of epidemics by way of increasing contamination among herds of cattle.

A detailed interview made with one animal health assistant and one technician indicated how flooding affects livestock health. Accordingly, the experts noted that flooding contributes to the increasing livestock epidemics in two ways. (1) It inundates large hectares of grazing lands and causes a decline in the supply of grass and fodder which exposes livestock to starvation. This in turn makes them susceptible to diseases by reducing their immunity as it results in emaciation of their body. (2) It creates favorable media for the spread of disease causing organisms and opportunities for the contamination among herds. According to the experts, some common types of diseases that affect livestock in study *kebeles* include, foot and mouth disease, lumpy skin disease(locally called *gureb-reb*),anthrax(*Aba-senga*), indirectly through its effects of inundating grazing fields, which decreases the supply of fodder and caused emaciation to livestock. Such effects of flooding also made livestock susceptible to diseases.

3. Impacts on the environment

The impact of flooding on the environment is difficult to specify as it often takes several years to unfold. However, certain locally specific impacts were identified through interviews made with the *wereda* land use and environmental protection experts on the actual and potential effects of flooding on the local environment. The results of these discussions are presented as follows.

(a) Long-term effects on the environment

As indicated by the informants, the increasing flooding in the study area is likely to disrupt the biodiversity in and around Lake Tanna. According to land use and environment protection experts, flooding accumulates silt in the lake which reduces the volume of the lake and increases the overflow the lake's water during rainy seasons as a result of which the fragile wetlands around the lake can easily get destroyed. According to the *wereda* land use experts, some damages on these wetlands have already been observed in the *wereda*. These wetlands are critical in keeping the ecological balance of the lake and serve as places where fishes hatch their eggs and some unique animal and plant species live. Moreover, the experts have disclosed that the recent practice of farming in these lands associated with the shortage of farmlands owing to population pressure is hastening the damage of the wetlands. These findings from the discussions suggest that recurrent and severe flooding can have adverse impacts on the over all environment in the area as it produces a chain of effects that would finally culminate in the loss of biodiversity and ecological resources. However, no clear-cut conclusion on the impacts of flooding on the environment can emerge from these discussions, since a more detailed study on the impacts of flooding is required in the study area.

(b) Short-term effects /land degradation and loss of fertility of farmlands

The participants have indicated that flooding has already affected the fertility of farmlands and grazing lands. According to them, the recent floods have brought and accumulated silts, sands and debris on farmlands. In relation to this, one of the respondents during focus group discussions in *Tanna weina kebele* spoke: *"flood waters are bringing rocks, sands and all sorts of rubbish and leave them on our farmlands....these rubbish, [particularly plastic bags coming from towns] are making plowing and growing crops difficult."*

In addition, participants have noted that flooding has brought some weed species to farm and grazing lands which were not previously known in the study area. As it was observed, these weeds have already colonized large tracts of grazing and farmlands in

both *kebeles*. Some of the weeds identified by the key informants include, *Serke Ababa*, *Kuremba*, *ye-gumare sare* and *menati esoehe*. These plants can easily replicate themselves and have strong thorns that can not be easily chewed by cattle. Some of them like *serke Ababa* produce a pungent smell that repels animals. Such characters of these weeds partly explain why they have dominated large hectares of grazing and farmlands.

The detailed discussions held with the *woreda* experts have also confirmed the farmers' opinion on the effects of the recent floods on the fertility of their farmlands. These findings highlight the importance of working on environmental protection to reduce environmental resources degradation that adversely contributes to increased hazards and, vulnerability and loss of resilience which in turn leads to increased poverty.

5.3. Livelihood resilience of households in the face of flood-disasters: major determinants

5.3.1 The resilience and vulnerability of households in the face of flood disasters

The notion of livelihood resilience is closely linked to sustainable livelihood systems, which allows people to follow active livelihood strategies that enable them to cope with risks and use opportunities as they unfold (Scoones, 1999). This implies that the use of the concept in the context of disaster mitigation is very helpful in shading light on livelihoods' ability to withstand and recover from the impacts of disasters. In this regard, Mayunga (2007), defined the term as "the capacity or ability of a community to anticipate for, respond to, and recover quickly from impacts of disaster". This definition suggests that resilience is a key to reducing the impact of disasters. In line with this view therefore, an attempt was made to assess the livelihood resilience of households by focusing mainly on factors related to their vulnerability and the major determinants of their resilience in the face of flood-shocks in the study *kebeles*.

Owing to the complex nature of the concept and the lack of an exact equivalent to the word resilience in Amharic, it was necessary to first obtain farmers' meanings of the terms through group discussions. Accordingly, the participants of FGDs in both *kebeles*,

agreed that the concept has a positive connotation in the sense that it matched with certain terms like 'ability', 'capacity', 'strength' and 'resistance'.

Moreover, most participants contrasted the term with 'weakness', 'poverty' and 'destitution'. For instance, participants in the FGDs held in *Tanna Weina kebele* noted the following:

farmers who are unable to replant their plots after the receding of the flood waters, are mostly those who are already weakened by poverty and ill-health and unless they get some help from the government they are most likely to be impoverished as a result of even a moderate flooding

In general, resilience was understood as a state of having strength to quickly recover from the damages caused by flooding. A key component of livelihood resilience for many participants of FGDs and key informants was articulated as the ability to regain pre-disaster level of living with out being descended into further poverty.

Moreover, during the focus group discussions it was indicated that flooding as a livelihood problem does not affect households equally in the study *kebeles*. This implies that resilience of households is understood more in relative terms which further indicate the need to set some locally specific indicators in order to differentiate households in terms of their level of resilience. In this regard, the FGDs made with farmers in the study *kebeles* yielded some useful locally specific indicators that helped to measure the level of resilience of households.

Accordingly, the participants identified the location of farmland, critical asset holdings such as a pairs of oxen, the ability to draw help from relatives in other *kebeles*, and time taken to recover from the impact of the floods as some of the major indicators of the livelihood resilience of households faced with flood- disasters in the study *kebeles*. (Table 21). The categories were also used in the household survey to differentiate sample heads of households roughly in to three groups namely, those with high resilience, those with medium resilience and households with poor resilience or more vulnerable to flooding. These three categories only show the level of resilience of households in

comparative terms and do not necessarily signify clear boundaries as they are only used to facilitate the analysis process. In addition, they do not show some causes of vulnerability such as illnesses, divorces and similar idiosyncratic factors that contribute to the loss of household livelihood resilience.

Table 21: Perceptions of people on factors affecting their livelihood resilience in the face of flooding in the study *kebeles*

factors	Relatively resilient households	Households with Medium resilience	Households with poor resilience / more vulnerable households
Time to recover from the impacts of major floods	2- 3 months	6 months	More than 6 months
Size of farmland	8-10 <i>kada</i> (2.0-2.5 ha)	4-8 <i>kada</i> (1.0- 2ha)	Less than 4 <i>kada</i> (1.0 ha) but mostly landless
Livestock holding	-Minimum 4 farm oxen -2 cows -2 donkeys & 1 or 2 mule	-minimum 2 farm oxen -1 or 2 cows 1 donkey	- 1 farm oxen or none - no cows - no pack animals
Exposure to flooding	Farm plots and homesteads located far from river banks	Farm plots and homesteads located far from river banks	Farm plots and homesteads located near the river banks or on the way where major rivers usually break their banks
Availability of Social capital	Have relatives in other <i>woredas</i> or <i>kebeles</i> and are able to send their cattle to these places before the coming to the rainy season on regular basis.	occasionally draw some help from relatives in other <i>kebeles</i> in the form of seeds or food grains at times of flooding	Largely depend on relief grains at times of severe floods or resort to taking loans from other households

Source: FGDs and key informant interviews, 2008

As indicated in **Table 22**, 54.6 percent of the survey respondents reported having low resilience in the face of flood disasters in the study area. Conversely, only 4(4.8%) of the households reported having high resilience in the face of flood disasters. These results apart from stressing flooding as a major livelihood shock, seems to suggest that increasingly more and more households are becoming vulnerable and less capable to withstand and cope with the effects of floods in the study area.

Table 22: Resilience of the household in the face of flood disasters

Household Level of resilience in the face of flood disasters	Frequency	Percent
high resilience	4	4.8
medium resilience	34	40.5
low resilience	46	54.6
Total	84	100.0

Source: household survey, 2008

5.3.2 Factors that determine the resilience of households in the face of flooding.

Through FGDs and interviews, it was possible to identify major factors that limit the resilience and coping capacity of households in the face of flood disasters. Accordingly, participants and informants have identified a range of factors that determine the resilience of households, by focusing mainly on the major flood disasters that occurred in the study *kebeles* in the past ten years. Since the majority of factors relate with livelihood resources and access to them, attempt was made to assess the household livelihood situations by using a combination of qualitative and quantitative methods. Below, the major factors that determine the resilience of households are discussed.

5.3.2.1 Natural capital: land

In any rural community land is a basic productive resource, and access to it determines the well being of a given livelihood. According to the findings of this study however, farmland location, and fertility were indicated to be more important than a mere access to land in determining the resilience of households in the face of flood disasters. The FGDs and interviews made with the study households indicated that the qualities as well as the location of farmland are the key factors that limit or enhance the resilience of households to flood-induced shocks. In terms of location, the proximity of farmlands to rivers was mentioned to have a significant role in determining the vulnerability and resilience of households more than the size and fertility of farmlands. This finding was also supported by data obtained from the household survey, in which farmland ownership was not found to have a significant effect on the resilience of households as almost all of the households (96%) own farmlands and those who do not own their own land were found to be equally distributed among the respondents.

This however can not be taken to mean that access to land does not have a role in determining the resilience of households. In fact, it could be argued that access to land may indirectly determine resilience. The detailed discussions with participants of FGDs and key informants also indicated that farmers with no land holdings are less resilient to the effects of flooding as compared to those who have land or can access land through various mechanisms. This, as mentioned by focus group discussants and informants, was to be expected since the landless would lose their income largely drawn from wage labor on farms of other farmers during flooding and are likely to be affected even by moderate flooding as they lose the daily wages they earn from certain activities like weeding. Most participants of the FGDs also noted shortage of farmland in their respective *kebeles*. This problem, according to an informant from the DWARO, have forced farmers, particularly the young ones to encroach the wet lands found on the shores of Lake *Tanna* for planting horticultural crops such as spices.

These findings agree with other studies that depict small landholdings, land degradation and population pressure as the major causes of vulnerability to disasters. For instance, Kifle(1997), based on traditional wealth ranking finds that more than 43 percent of the Shone area population in SNNPR, are highly vulnerable to drought induced shocks of even a slight magnitude as most of them suffer from the shortage of land owing to population pressure.

5.3.2.2 Economic capital: financial asset

Economic capital generally refers to financial resources that, in times of shocks could be used to reduce vulnerability and enhance recovery (Mayunga, 2007). The major forms of economic resource that were identified by the study households as having direct influence on the resilience or coping capacity of households are discussed as follows.

(a)Livestock holding

Focus group discussants in the two study *kebeles* have identified the size and type of livestock owned by a household as a factor that determines the resilience of households. According to the focus group discussants, households who own a large number of livestock tend to be more resilient to the effects of flooding as they use the animals as a buffer stock. This gave them the financial capacity to quickly regain their livelihood, as they would sell their livestock and use the money to buy seeds, rent-in farmlands for planting secondary crops when the flood waters recede.

An interesting insight is also gained from the FGDs regarding the type of livestock and its role in the resilience of the household. Accordingly, the participants of FGDs mentioned that possession of farm oxen often enhances the resilience of households, since it gives the advantage of draining flood water from farmlands so as to lessen crop damage or failure. The results from the household survey also indicated that all of the respondents who have reported having no oxen, were found to belong to the low resilience category (**Table 23**).

However, focus group discussion participants and key informants alike agreed that flooding, with increased volume of water and duration, affected livestock and reversed the situation in recent years, in which those with more livestock were affected the most, since they lost their livestock during the floods through drowning and in the aftermath through various diseases and lack of fodder, which in turn affected their productivity. In view of this one key informant made the point:

A decade ago, farmers in our village used to keep many cattle. In fact, some farmers used to own as much as 60 heads of cattle. Currently however we are having problems even to keep our farm oxen as the grazing fields are now covered with weeds and the cattle are starving as they no longer find those fine grasses that used to grow in the fields.

Table 23: Availability of draft power for farming and the resilience of the Household in the face of flood disaster

Availability of draft animal or a pair of oxen for farming		The resilience of the household in the face of flood disaster			Total
		high resilience	medium resilience	low resilience	
Yes	Count	4	34	36	74
	%	5.4%	45.9%	48.7%	100.0%
No	Count	0	0	10	10
	%	.0%	.0%	100%	100.0%
Total	Count	4	34	46	84
	%	4.8%	40.5%	54%	100.0%

Source: household survey, 2008

(b) Access to credit

Access to credit services was the other form of financial capital, identified by household heads participated in the study, as having effect on the resilience of households.

According to the household survey 36.9 percent of the respondents were able to have access to credit. And out of these, only 24 percent of them were able to receive loans

from formal rural credit services (*Amhara Saving and Credit Institution*) (**Table 24**). This indicates that there is lack of access to credit, which is crucial in helping households to quickly recover from the effects of flood-induced shocks to replace lost assets and income. During the FGDs and interviews, it was also mentioned that households with no oxen, land and other assets were excluded from receiving loans as they were unable to furnish collateral. In relation to this, a young informant from *Tanna Weina kebele* disclosed: “we are not given credit; they [ASCI] only give it to household heads who own land”. This exacerbates their vulnerability to the effects of flood -induced shocks.

Table 24: Access to credit services

In the last 12 months, has any member of your household borrowed any money?	Frequency	Percent
yes	31	36.9
no	53	63.1
Total	84	100.0
The source credit for the household	Frequency	Percent
ASCI	7	22.5
private lenders	24	77.4
Total	84	100.0

Source: household survey, 2008

During the discussions, it was also indicated that those who have better access to credit were in a better position to withstand the aftermath shocks of flooding, as they can replace their lost assets. Participants of the FGD from the *Gura Amba Kebele* mentioned that there was good access to credit services as opposed to those in *Tanna Weina kebele*. This difference in accessing credit could probably be explained by the differences in the degree of physical proximity to the main credit provider i.e. Amhara Saving and Credit Institution. Some informants from *Tanna weina kebele* have also asserted that credit service was not made available to farmers living in most villages as the staffs of ASCI avoid remote *kebeles* since there is a need to make frequent visits in attempting to ensure repayments.

Generally, it can be argued that those households with economic capital in the form of livestock and credit are in a better position to withstand and recover from the effects of flooding as such assets contribute to their resilience through creating more opportunities for livelihood diversification that enable households to manage and cope with flooding in more sustainable ways.

The FGD participants in both *kebeles* mentioned that more resilient households have the capacity to engage in both on-farm and off-farm diversification activities and keep a relatively good stock of animals in neighboring *woredas* that enables them to further offset livelihood shocks during major flood disasters like that of the 2006 *kremet* floods.

5.3.2.3 Human capital

Human capital as referring to the level of education, health conditions and availability of skilled labor was repeatedly mentioned as an important factor that shape the resilience of households and communities to disaster-induced shocks in the literature (e.g. Mayunga, 2007; Adger, 2000). In this study, the availability of labor in the household was found to be the most important form of human capital that contribute to household resilience in the face of recurrent flooding.

The qualitative data obtained from interviews and FGDs have also indicated that the availability of labor in a household play a determining role in enhancing the resilience of households. For instance, in explaining the role of labor in household livelihood resilience an informant in *Gura Amba kebele* noted that “*a farmer with no asset can live by the sweat of his brow as long as he is healthy and capable to work*”. This clearly shows the value of labor in the livelihood resilience of households.

Looking at the educational status of households as one component of human capital that determines the resilience of households, the results from the survey showed that there is no marked difference in terms of educational level between the highly resilient and the less resilient groups. The level of education of household heads was therefore found to

have no significant role in determining the resilience of households in the face of flood disasters as can be shown in **Table 25**.

Table 25: Educational status of the head of the household and resilience of the Household in the face of flood disaster

Educational status of the head of the household	The resilience of the household in the face of flood disaster			Total
	high resilience	Medium resilience	low resilience	
Illiterate	1 3.3%	10 33.3%	19 63.3%	30 35.7%
Able to read and write	2 6.5%	15 48.4%	14 45.2%	31 36.9%
Primary education completed	1 5.5%	7 38.8%	10 55.5%	18 21.4%
Secondary education and above	0 0%	2 40%	3 60%	5 6.0%
Total	4 4.8%	34 40.5%	46 54.8%	84 100%

Source: household survey, 2008

Participants of FGDs also mentioned that a household with adequate labor can engage in dyke construction and drain their farmlands. Moreover, they can also work on farms of other farmers found in less affected *kebeles* and are able to maintain their household income during times of extreme floods. However, the lack of access to alternative-income earning activities in the *woreda*, coupled with the severity of the recent floods which affected most farmers were mentioned as problems that limit the role of labor in particular and human capital in general in building the resilience of households.

5.3.2.4 Social Capital

The role played by social capital in building the livelihood resilience of communities and households is emphasized in many studies (e.g. Mayunga, 2007; Luttrell, 2001; Handmer, 2003). Social capital is also recognized as an important determinant of disaster resilience of communities and households as it helps them to collectively mitigate the effects of

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disasters, through spreading risks. According to Mayunga (2007), social capital can be measured by using such indicators as involvement or participation in local institutions or organizations and informal networks.

Thus, recognizing the role of social capital in livelihood resilience of households, the current study attempted to identify and assess the existing local CBOs in terms of their role in enhancing the resilience of studied households in the face of flood disasters. Accordingly, through FGDs and interviews three major forms of social networks (CBOs) that could serve as a basis of social capital were identified. These forms of social institutions are discussed in the following subsections.

The major forms of social capitals or networks identified through FGDs and interviews were 'Debiat', 'Assana qeber' and mehaber/senbete. The following discussion focuses on these CBOs and other social networks.

Debiat and Assana geber

Debiat and *Assana geber* are the two most common and important social networks identified by participants of FGDs and informants. *Debiat* is a form of mutual labor exchange arrangement in which farmers contribute labor in weeding or sowing activities, which mostly require additional labor. *Debiat* often involves a group of 15 to 20 individuals who exchange labor in turns. According to the participants of FGDs, most households use this form of social support. The results from the household survey also indicate that the majority or 88 percent of the respondents reported that they were members of *Debiat* (Table 26).

Table 26: Participation in festive work groups such as 'debo/debaet'

Do you participate in <i>Debaet</i> ?	Frequency	Percent
yes	74	88.1
No	10	11.9
Total	84	100.0

Source: household survey, 2008

However, during detailed discussions with key informants it was found out that the role played by *Debiat* in helping to cope with the effects of flooding is limited as the severity of flooding increased in the area. In fact, a DA from *Tanna weina kebele*, who has lived in the area for more than 15 years, said that:

Farmers are not helping one another through Debiat as they used to. Now, everyone seems to focus more on saving his farmland from flood waters. In doing so, they often drain flood waters from their farms and send it to their neighbors and this has resulted in many conflicts among neighbors.

Asana geber is the other form social capital found in the study *kebeles*. This unlike *Debiat* is not a form of mutual labor exchange arrangement. It involves free contribution of labor and draft animals to members who are unable to work on their farms due to ill-health and old age. According to informants, the types of works done in *Asana geber* were not limited to weeding or sowing as in the case of *Debiat*, and it includes the construction of houses, and plowing.

Mehaber or *Senbete* was also found to be another social institution in which households participate in the study area. Members of *mahebe* or *Senbete* regularly meet to celebrate Saint's days. According to the results of discussions made with informants in the study *kebeles*, such institutions help to strengthen common values among the community and play major roles in resolving conflicts through reconciliation and arbitration. The contribution of such institutions was also mentioned to be increasing as they help to

resolve much of the conflicts that arise between households as a result of flood damage of farmland boundaries.

Generally, the results from FGDs and key informant interviews indicated that the roles of *Debiat* and *Asana qeber* as the two common sources of social capitals in helping to resist the effects of flooding by the study households. However, the roles of these institutions were found to be limited as households lack the capacity to mitigate the impacts of severe flooding with wide ranging effects and scale of coverage affecting almost all households. In view of this, the participants of FGDs in both *kebeles* indicated that *Assana qeber* played a nominal role in enabling households to cope with flooding and its impacts, as more and more households have been affected by the recurrent floods, and were unable to contribute free-labor in the form of *Asana qeber*. This finding mirrors the general assertion in the literature which indicates the failure of social capital drawn from informal arrangements and CBOs in providing insurance against widespread disasters that affect almost all households in a community (Derze & Sen, 1989; Desalegen, 1991).

Although *Debiat* and *Asana qeber* were not found to have significant contributions to enhance the resilience of households, other forms of social ties were mentioned by FGDs participants and informants as having positive impacts on the livelihood resilience of households. Participants have also indicated that they use social networks (mainly from kin or relatives living in other *kebeles*) to call on help in times of crisis in the form of money or food. Drawing on supports from such networks, especially from family members who regularly send remittances was mentioned as one important form of social capital that enabled households to rebound from the effects of flood disasters. This shows how social capital enhances the resilience of livelihoods to disasters, by way of enabling households to cope with and adjust easily to the impacts of flooding without compromising the livelihood security of the households. This is in line with findings of other studies which indicate that social networks facilitate access to resources and help to regain lost assets in the event of natural disasters (Yared, 2002).

In general, the findings of the study indicate that the roles played by social networks were largely limited and the numbers of households who do not participate in such networks were indicated to be declining. This implies that households with less participation in social institutions are more likely to have less capacity to withstand and recover from flood induced shocks than households that have more social networks and participation in social institutions.

In addition, during FGDs and interviews with informants it was disclosed that households draw supports from relatives living in other *kebeles* than relying on social networks within their *kebeles*. This indicates the failure of local CBOs as sources of social supports, to provide help for households affected by floods. As a result, more and more households have begun to rely on formal transfers than on these arrangements. The data obtained from the household survey have also indicated that 53.6 percent of the households reported having relied on formal transfers mainly in the form seed assistances for replanting their farmlands (**Table 27**). Figures obtained from secondary data also confirm an increase in the number of aid recipients in the *woreda*.

Table 27: Relying on formal transfers or public relief assistances coming from government or NGOs

Relying on formal transfers	Frequency	Percent
Yes	45	53.6
No	39	46.4
Total	84	100.0

Source: household survey, 2008

These findings indicate that most of the studied households are becoming less resilient to the effects of flooding as a result of frequent loss of assets which is likely to make them more vulnerable to subsequent livelihood shocks. In this regard, attempt was made to capture the perception of respondents on their household livelihood situation in comparison to the previous year (1999 E.C.), the results indicate that 70.2% of

households feel that they are likely to be more vulnerable the effect of shocks, while only 3.6 percent of the respondents perceived that they are doing well and are more resilient to the effects of shocks (Table 28).

Table 28: Self assessment of household livelihood situation in the present Time/2000 E.C/ as compared to last year (1999 E.C)

Self assessment of household livelihood conditions	Frequency	Percent
doing well- sustainable and more resilient to the effects of shocks	3	3.6
Doing just ok-viable or less sensitive to the effects of shocks	19	22.6
Struggling, vulnerable to the effects of shocks unable to meet the household needs-	59	70.2
Destitute and highly sensitive to the effects of shocks and less resilient	3	3.6
Total	84	100.0

Source: household survey, 2008

In general, Poor households in the study area are increasingly unable to resist or withstand the effects of flooding as they lack all the necessary assets and social networks needed to offset the problems associated with flooding. This can partly be explained by the severity of the recent floods in the study area which made households lose their immediate social ties as more and more households are losing their capacity to withstand the effects of such wide scale disaster. In contrast, Households that have social capital in the form of support from immediate family members (working in some cities like Gondar and Bahir Dar) were found to have better capacity in coping with recurrent flooding. This goes in tandem with the existing literature which indicates the major benefit of social capital as the provision of vital safety nets most needed in times of disasters (DFID, 1999).

5.3.2.5 The degree of exposure to flooding

The degree of exposure to flood risks was found to be the most crucial factor in determining the resilience of households in the study *kebeles*. The results of qualitative interviews and discussions showed that households that were exposed to recurrent floods lost assets gradually which made them more vulnerable to the impacts severe flooding. The degree of exposure to flooding was in turn determined by the physical proximity of farmlands and settlement areas (villages) as well as the social vulnerability of livelihoods which is mainly reflected in poor asset holding. However, despite the conventional assertion in the literature which states that asset holding largely determines the resilience of livelihood systems, the study found out that it did not contribute much to the resilience of households that were faced with severe and widespread flood disasters.

Literature suggests that asset holding largely determines the capacity of people to withstand and recover from disasters, in this study however; it was found out that asset holding did not contribute much to the resilience of households in times of severe floods. In fact, it was mentioned by participants of FGDs and informants that those households who were better-off in terms of asset holdings were affected the most as they lost more assets accumulated through years of hard labor in the flooding of 2006 *kremet*. This however, does not mean that asset holding did not contribute to the resilience of households, it only confirms the fact that not all households in the study area were exposed to floods to the same extent and therefore were not affected in similar ways, indicating that exposure to flood events is a crucial factor in determining its effects on livelihoods. For instance, participants of FGDs in *Tanna weiena kebele*, noted that the extent of flood damage on standing crops relied more on the proximity of a farmland to river *Megech* than on the wealth of the household. According to them, households whose farmlands are located near to the river are exposed to more flooding during the *Belg* rains in addition to the flooding in the *Kremet* season. The survey results also supported this claim made by the participants of FGDs and further indicated that those households who reported having being exposed to flooding more than twice with in a year were also reported to belong to the low resilience or more vulnerable group (**Table 29**).

Table 29: Frequency of exposure to flooding in the area and the resilience of the household in the face of flood disaster

Frequency of flood exposure		The resilience of the household in the face of flood disaster			Total
		high resilience	medium resilience	low resilience	
once in a year	Count	3	14	12	29
	%	10.3%	48.3%	41.4%	100.0%
Twice in a year	Count	1	17	11	39
	%	2.6%	43.6%	53.8%	100.0%
More than two times a year	Count	0	3	13	16
	%	.0%	18.8%	81.3%	100.0%
Total	Count	4	34	46	84
	%	4.8%	40.5%	45.8%	100.0%

Source: Household survey, 2008

In sum, the extent of flood exposure was found to determine the livelihood resilience of households as it is directly linked to the level of damage on livelihood assets, which consequently makes them more vulnerable to subsequent flood events, with even less severity as they lose their buffer capacity to withstand them.

5.3.2.6 Access to infrastructural facilities

Access to rural infrastructure facilities directly or indirectly determines the resilience of households in the face of flooding .Flood control structures such as dykes, flood walls and levees, dams, river, embankments and the like can help to reduce peoples' flood exposure (Hewitt, 1997). Thus, it can be argued that such physical structures somehow contribute to enhance the resilience of livelihoods as the impact of flooding is largely contained and reduced.

Thus, to assess the role played by such flood control structures in enhancing the resilience of households in the study *kebeles*, it was attempted to identify and investigate the effectiveness of some of the major physical flood mitigation measures in the study *kebeles*. And through FGDs, key informant interviews as well as direct observations it was found out that dyke construction was the major type of physical flood control structure employed by farmers. However, it was found out that dyke construction has not been effective in protecting livelihoods in the face of severe and recurrent flooding. According to the informants, such structural measures failed to provide the intended protection as they were poorly constructed in a rush and with lack of coordination and linkage between farmers and experts that were assigned to mobilize the public to construct the dykes. One informant expressed his views in a tone of resentment as follows:

...we were given empty sacks [sandbags] and some of the farmers did not construct deldel[dykes] with them and they simply took the bags and used them to put grains. Others were piling most of the sacks near their farmlands, at the expense of exposing other areas to more flooding.

Regarding the use of other structural flood control measures such as dams and flood diversion structures, the *Woreda* officials mentioned a World Bank project intended to build a dam on the river *Megech*. According to them, the proposed construction of the dam will incorporate an integrated watershed development in five *woredas* and is likely to contribute to reducing the problem of flooding in the area. However, participants of FGDs in both *kebeles* expressed their fear of dislocation and concern over losing their farmlands as a result of the construction of the proposed dam and flood/river diversion structures.

5.3.3. General characteristics of households and their level of resilience

Through FGDs, interviews and the household survey, the study found the following characteristics of households as the most visible indicators of the livelihood resilience in the face of flooding in the two *kebeles*. Accordingly, the highly vulnerable and less resilient households were found to be (1) female-headed households than households headed by men. For instance, **Table 30** shows that 71.4 percent of the female headed

households were found to have low resilience as compared to only 49.2 of male headed households. (2) Households whose farm plots and homesteads are located close to river banks. (3) Those who have been hit by severe flooding more than twice in the last 10 years and (4) those with no access to credit.

The characteristics of the relatively more resilient households were found to match with those in the literature. These households which only make 4 percent of the total sampled households were found to recover swiftly from the damages of major floods, with a lesser probability of going through hardships such as dislocation loss of assets and food insecurity. In fact participants of focus group discussions held in *Tanna weina kebele* revealed that:

They [the more resilient households] often benefit from the floods, as they get more people willing to work on their farmlands for cheap wages. And they cultivate more lands as more and more people rent out their farm plots as they have already lost seed stocks and farm implements.

Table 30: The resilience of the household in the face of flood disaster and Sex of Household head

The resilience of the household in the face of flood disaster	Sex of household head		Total
	male	female	
high resilience	4 100%	0 0%	4
medium resilience	28 82.4%	6 17.6%	34
low resilience	31 67.4%	15 32.6%	46
Total	63	21	84

Source: household survey, 2008.

5.4. Household coping strategies

Rural households employ different ways of coping with the impacts of natural hazards such as floods. These coping strategies are the results of years of experiences of living with hazards and involve the use of local resources and skills in different combinations and levels. Coping strategies are often used sequentially depending mainly on the nature of the hazard and availability of resources which in turn determine the type and effectiveness of the strategies (Wood, 2003).

In the previous sections, the effects of flood disaster on livelihoods and the resilience of households in the face of flood disasters were discussed. In this section, the types of strategies that were employed by households to cope with the effects flood disasters and is discussed to be followed by an assessment on the effectiveness of the major coping strategies and factors that influence their effectiveness.

5.4.1 Types of coping strategies

The results from both the qualitative and quantitative investigations suggest that households in the study *kebeles* employ a range of strategies in an attempt to cope with the adversities of frequent flood-disasters. These strategies roughly fall into the following categories/typologies.

5.4.1.1 Economic/material:

The use of economic/material resources is considered as a major coping strategy to the effects of natural hazards in the literature (DFID, 1999; Ellis, 2000). Within this broad category, diversification of income sources is identified as an effective coping strategy, while asset disposal particularly the sale of productive assets such as animals, farm implements, seeds or land is considered as a sign of vulnerability and lack of capacity to cope with adversities.

It emerged from both the qualitative inquires and the household survey, that several economic responses have been adopted by households to cope with the effects of

flooding in the study area. Some of these coping strategies are discussed in the following sub-sections.

(a) Diversification of livelihood activities

Results from the household survey indicate that only 37 (44%) of the respondents reported employing diversification of livelihood activities as a coping strategy to flooding. However as discussed in section 4.2, a closer investigation in to the livelihood activities pursued by survey households indicated that only 1.2 percent of the respondents were engaged in non-farm activities such as trade.

This finding is also reflected in FGDs where most of the participants mentioned migration in search of seasonal wage labor to places like *Humera*, as the only means of generating non-agricultural income. This situation is consistent with the findings of the study on destitution in Northeastern highlands of Ethiopia conducted by Sharp, Devereux and Yared(2003). Based on their findings the authors assert that “*labor migration is, and has been for generations an important component of livelihood diversification and coping strategies for many households who continue to base their lives in the villages and to consider themselves primarily farmers*” (Sharp, Devereux & Yared, 2003).

In addition, labor migration being used as a major form of income diversification strategy can be interpreted as an indication of the lack of other income diversifying opportunities in the study *kebeles*. For instance, during focus group discussions, participants have mentioned the lack of credit and infrastructures such as an all weather road as obstacles to pursuing non-farm income diversifying activities such as trade. These results are broadly in agreement with more detailed studies conducted on household coping strategies towards drought (e.g. Salih, 2001; Sharp, Devereux & Yared, 2003).

(b) Borrowing food or cash

Borrowing food or cash to meet needs during flood disasters was identified as a form of coping strategy by most of the participants of FGDs in both *kebeles*. According to the

results of in-depth interviews made with informants, cash or grains were borrowed from relatives, neighbors, and money lenders. However, the practice of borrowing grains from relatives or neighbors was reported to have declined considerably in recent years as almost all households were hit by the 2006 and 2007 consecutive severe floods in the *kebeles*. These floods have washed away their standing crops and grains in their stock. As a result of this, households were resorted to borrowing cash from private lenders with the obligation of paying the extraordinary interest rate demanded by the lenders (sometimes 100%). Consequently, most informants reported that borrowing cash as a coping strategy was perused by only few and desperate households as it only creates liability and loss of critical livelihood assets in the long run. Participants of the FGDs have also mentioned preferring borrowing seeds to cash for the reasons of avoiding the excessive interest rates charged by lenders.

These results were also confirmed by the data from the household survey, which revealed that about half of the respondents (51.2%) use borrowing seeds for planting secondary crops as a coping strategy (Table 31).

Table 31: Borrowing seeds as a coping strategy

Did you use borrowing seeds as a coping strategy?	Frequency	Percent
Yes	43	51.2
No	41	48.8
Total	84	100.0

Source: Household survey, 2008.

(c) Assets selling/disposal

It emerged from the study that asset disposal was not largely pursued by households in the study *kebeles*. In this regard, the household survey findings indicate that only 19(22.6%) of the respondents reported the selling of assets such as oxen (Table 32). The

findings of the FGDs also confirm that households do not usually resort to selling assets, and prefer other strategies like renting out some assets like land, oxen or pack animals. And only sell these assets when faced with total livelihood failure. The findings seem to strongly suggest the notion that coping strategies are largely employed with a deliberate intention of securing livelihood in the future, even at the expense of current consumption (Ellis, 2000).

Table 32: Selling household assets including farm ox as a coping strategy

Selling household assets as a coping strategy?	Frequency	Percent
Yes	19	22.6
No	65	77.4
Total	84	100.0

Source: household survey, 2008

However, the lack of opportunities to diversify household income sources, coupled with the increasing severity and frequency of flood-hazards in the last couple of years was mentioned by the FGDs participants and key informants as a contributing factor that forces households to resort to asset selling as a coping strategy. Participants of the FGDs also noted that households that are exposed to severe flooding tended to sell critical livelihood assets such as oxen or livestock more likely than the case for households exposed moderately to floods. For instance, one discussant from *Gura amba kebele* explained how he decided to sell two of his three oxen:

After loosing 6 kada[1.5 ha] of teff in last year's floods, I took loan from my brother living in another kebele to buy seeds[check peas] to plant them in September. Unfortunately however, the sowing time passed as I was sick and took to bed for several weeks along with my family then after, I sold one of my oxen and bought food for the family and sold the other a month back for a very low price [since it was emaciated owing to the lack of fodder] to purchase seeds and to repay the loan that I took from my brother.

During detailed discussions with informants, it was also mentioned that the consumption of seed stocks which had been rare in the past, has been used as a coping strategy at times of severe flooding like that of 2006 *Kremt* season. Such coping strategies resemble with what is often documented in the case of drought shocks in the literature (e.g. Salih, 2001).

These findings indicate that asset disposal as a coping strategy is to be expected to increase in the study area, with the increasing severity of floods. This strategy in turn exacerbates the vulnerabilities of households by eroding their asset bases and resilience.

5.4.1.2 Technical coping strategies

Households in the study kebeles were not new to flooding. They have experienced flood-disasters for generations and developed various ways of protecting their life and livelihoods in ways that reflect their capacity to cope with the problem by using their own resources and skills. Some of these strategies can be categorized under technological coping strategies and are discussed as follows.

(a) Changing cropping patterns

When a household is exposed to a recurrent loss of food production as a result of climatic-hazards, change of crop patterns is a frequently observed coping strategy with the view of fending-off food insecurity (Salih, 2001; Desalegen, 1987).

The results of this study also reveal similar trends. Accordingly, out of the 84 respondents of the household survey, 74(88.1 %) of heads of households reported that they have changed crop types and cropping patterns from the conventional *teff* or wheat to finger millet and leguminous crops (**Table 33**). Findings from the study on the impacts of the 1998 floods in Bangladesh, also found similar results in which farmers changed cropping patterns to adjust to the impact of the floods (IFPRI, 2001).

When asked about the option of using their farmlands for rice production, some farmers from *Tanna Weina kebele* claimed that the benefit of rice has not been well introduced to the farmers in the *woreda*. However, an expert from the *woreda* Agriculture and Rural

Development Office disclosed that 53 quintals of rice seeds have been distributed for farmers in all the nine flood prone *kebeles* in 2007. According to him, DAs are giving technical support to the farmers as a result of which some farmers have benefited from rice production. Nevertheless, through detailed discussions with DAs and farmers it was found out that very few farmers have benefited from rice production as most farmers detest the weeding work which requires a lot of labor.

Table 33: Changing crop types that better resist flooding and water logging

Do you change crop types as a coping strategy?	Frequency	Percent
yes	74	88.1
no	10	11.9
Total	84	100.0

Source: household survey, 2008

(b) Local dyke construction

Local dyke construction was found to be one type technological coping strategy employed by households in the study *kebeles*. In this regard, the analysis of findings from the questionnaire survey indicates that the majority (88%) of household heads reported dyke construction as a coping strategy to flooding (**Table 34**). Results from the qualitative investigations also reveal that dyke construction is the main coping strategy used by households in the *kebeles*. In fact, one expert from the *woreaa* Agriculture and Rural Development Office mentioned the possible relations of the use of dykes with the German Agro Action Rehabilitation Program's of 1988/89 impact on the attitude of farmers.

Table 34: Maintaining /constructing local flood control structures such as dykes

Do you use Dyke construction as a coping strategy?	Frequency	Percent
yes	74	88.1
no	10	11.9
Total	84	100.0

Source: household survey, 2008

However, the poorly constructed dykes on the river banks were also mentioned to have been aggravated the problem of flooding in some villages. In this regard, experts proposed the need to integrate dyke construction with biological conservation strategies like forestation to stabilize dykes.

Similarly, it was found out from the FGDs that households in the study areas construct houses to adopt to seasonal floods. It was also observed that people in the study *kebeles* build their houses with raised plinths to prevent flood waters from entering in to their houses and construct bed-like structures inside the house for storing household goods and to prevent household utensils from being washed away by flooding. Members of the households also use these beds as a living area in times of severe flooding.

The other technological flood coping strategies mentioned by participants of FGDs and key informants is draining the water in farmlands by using oxen and plough. However, this strategy was considered as ineffective in times of severe floods where the water level rises quickly on farm lands as in typical case of the 2006 *kremet* season flooding. Similar coping strategies were also found in most flood affected communities in Bangladesh and Vietnam (Shaw, 2006).



Figure 2. Flood dykes on the river *Megech*



figure 3. A house built with raised platform, and Plastered with mud to protect from being flooded.

5.4.1.3 Social/organizational coping strategies

At the time of disasters and soon after, people largely count on their kinship networks, mutual aid, self help groups and indigenous organizations to secure help and support (DFID, 1999). This indicates the potential roles that can be played by social organizations as a major source of social capital, in coping with disasters.

Despite this general benefit of social organizations, the findings of the questionnaire survey indicate that only 31(36.9%) of the respondents reported relying on informal social transfers as a coping strategy (**Table 35**). The reasons for this have come out in the FGDs where participants have mentioned the severity of flooding in recent years as the main obstacle for relying less on kinship networks and neighbors. Moreover, flooding has affected the majority people in neighboring *kebeles* so much so that it was impossible to get help from them. For instance, one key informant explained that the heavy rain in 2006 *kremet* season destroyed crops in near by *kebeles* as a result of which they were forced to “rely on relief grains to sustain their lives”. This opinion was also verified by data obtained from the Woreda Agriculture and Development Office that showed an increase in relief grain recipients.

Table 35: Relying on informal social transfers coming from friends and relatives

Relying on informal social transfers ?	Frequency	Percent
Yes	31	36.9
No	53	63.1
Total	84	100.0

Source: household survey, 2008

This seems to indicate that the role of social capital in helping individual households to cope with the flood disasters is highly restrained as the degree of severity of the problem increased, exposing more people with no one immune from it.

5.4.1.4 Other coping strategies

A part from the coping strategies discussed in the previous sections, the study also found that households in the two study *kebeles* use other coping strategies during and after flooding. In this regard, 35(41.7%) of the survey respondents reported “relocating dwellings to higher grounds” during the flooding seasons (Table 36).

Table 36: Relocating dwelling to higher grounds

Do you Relocate your place of residence to higher grounds?	Frequency	Percent
yes	35	41.7
no	49	58.3
Total	84	100.0

Source: household survey, 2008

Similarly, the findings from the FGDs indicate that households move their cattle to neighboring *kebeles* located in higher grounds as a means of coping with the floods.

However, some informants mentioned that such strategies depend largely on the “good will” of neighboring communities and has been a source of conflict between the neighboring communities in the last couple of years. An informant from *Tanna Weina kebele* noted: “we used to send our cattle to higher places. But, things look grim as people in the other kebeles started refusing to shelter our cattle”

5.4.2 The effectiveness of the coping strategies

The literature on coping strategies shows that the effectiveness and sustainability of the strategies depend among other factors, on the degree of exposure to the hazard/disaster, the frequency of the disasters and resource endowments of communities or households (Wood, 2003).

Similarly, household coping strategies can not be effective in the absence of support from local institutions. For reasons that Shaw (2006), notes “the poor, vulnerable communities cannot develop a strong coping mechanisms of their own as they lack information and skill development options” .Thus, the role played by local institutions in straightening the coping strategies of households and communities is of a paramount importance in lessening the impact of flood disasters on livelihoods and shortening the time required to recover from the effects of floods.

The effectiveness of coping strategies employed by the studied households in the two *kebeles* was found to be limited for reasons that will be examined below. Accordingly, 14.3 percent of the respondents on the household questionnaire indicated that the coping strategies were not effective and sustainable. The majority of the respondents (82.1%) have indicated that the coping strategies they employ were effective but not sustainable (**Table 40**).

This opinion was also confirmed during the discussions with officials and informants in the *woreda*, the results of these discussions revealed that demographic conditions such as population pressure coupled with dwindling resources, mainly land were mentioned as the major obstacles that render the household coping strategies ineffective and

unsustainable. In addition, lack of access to public infrastructure such as roads was mentioned as a factor hampering the income diversifying opportunities for farmers in the study area, which in turn lessen their chance of employing effective coping strategies. However, the issue of education, skill and labor capacity constituting the human capital of households can not be neglected as it play a central role in making these coping strategies effective. In this regard, Webb, von Braun and Yisehac (1992) assert that “the capacity for coping is not solely a function of the asset base: it is also a function of human capital accumulation” (Webb, von Braun & Yisehac, 1992: 31).

Table 37: The effectiveness and sustainability of the coping strategies

The effectiveness and sustainability of the coping strategies	Frequency	Percent
effective and sustainable	3	3.6
effective but not sustainable	69	82.1
not effective and not sustainable	12	14.3
Total	84	100.0

Source: Household survey, 2008

In the discussions made with farmers it was repeatedly mentioned that the scale of inundation/magnitude of flooding has increased in the recent years so much so that they have found their previous coping strategies ineffective. The participants have also stressed on the issues of access to credit facilities by government institutions that can help them augment their productivity and lessen the impact of flooding on their livelihoods. The timely supply of replacement seeds and flood-resistant seed varieties were also mentioned as problems by farmers in the study *kebeles*.

Similar problems were also mentioned by experts and DAs from the *woreda* in the two *kebeles* where the lack of attention given to local coping mechanisms was mentioned as a series problem that is setting back development efforts. For instance, one informant

mentioned that the disaster preparedness capacity in the woreda is in poor condition as revealed by the 2006 floods that affected several people in the *woreda*.

Access to flood retarding and diversion structures that protect people and their livelihoods from flooding have not been to the level desired as compared to the scale of flooding in the study area. For instance, the results of FGDs made with farmers in *Tanna weinea kebele* mentioned that local dyke construction was not proved effective as the level of flooding increased with unprecedented scale affecting every farmer particularly after *Megech* River broke its course. This indicates that successful structural measures on rivers, to protect farmlands and settlement areas against floods were not carried out.

Farmers in the study *kebeles* also mentioned the lack coordination between government efforts in mitigating floods and local coping strategies as adding to the scale of the problem. This was also admitted by experts from the *Woreda* Agriculture and Rural Development office. For instance, one expert disclosed that “*the use of Broad Bed Maker (BBM) was not adequately backed by technical trainings to farmers as a result of which it is not yet used effectively by farmers.*”

CHAPTER SIX

CONCLUSION AND SUGGESTIONS

6.1. Conclusion

Focusing mainly on the resilience and coping capacity of rural households in one of the flood prone areas in Ethiopia- *Dembia woreda*, the study attempted to show that the nature of flooding in the study area has markedly changed over the past decade. The floods have become more frequent and severe owing to a number of factors that derive from climatic and topographic conditions such as, periodic changes in the amount of rainfall, the nature of watershed system and soil type of the area. In addition, certain human activities including deforestation, increased settlement in flood plains and traditional systems of cultivation were found to aggravate flooding in the area.

The change in the nature of flooding was found to affect the livelihoods of people in many ways. Large areas of farming and grazing lands as well as villages have been seriously affected by floods. Flooding has destroyed crops and threatened the food security of people who live in an area which has long been known as food secure and therefore was not part of food assistance schemes such as safety nets. It also killed livestock; swept houses, granaries and other household properties; increased health hazards by creating favorable conditions for the spread of certain diseases like malaria and Acute Watery Diarrhea (AWD). It was also found out that the increased frequency and severity of flooding has caused and aggravated certain social problems like conflicts, displacements and family breakdowns. As a result of all these effects, flooding was found to be the major livelihood problem in the study area.

The study found out that almost half of the surveyed households (54.6 %) are less resilient and more vulnerable to the effects of flooding and related shocks. The resilience of households was found to be determined mainly by the access and use of livelihood resources or capitals. Accordingly, availability of farm oxen, credit as well as the ability to draw help from social networks were found to be the most important factors that determine the resilience of the studied households in the face of flood disasters. Factors

like the severity of flooding, income diversifying strategies and access to social and infrastructural facilities were also found to determine the resilience of the households.

The analysis of access to resources and livelihood activities revealed that most of the households are primarily dependent on subsistence crop production to earn their livelihood due to the limited income diversification opportunities in the area. This indicates that there is a high possibility of exposure to shocks induced by flooding which makes up the vulnerability context of their livelihood. This external vulnerability was found to be aggravated by the lack of or shortage of livelihood resources such as land, draft power and social capitals that made certain households more vulnerable to the effects of flooding than others. Thus, households whose farmlands and homesteads situated closer to river banks, asset poor households that suffer shortage of farmlands and draft power, female-headed households and those households with relatively lesser participation in social institutions were found to be the most vulnerable and less resilient to the effects of flood- induced shocks.

The study identified a range of coping strategies employed by households in the study area. These strategies however were found to be constrained mainly by the scale and impact of the recent floods and lack or shortage of basic infrastructural and social facilities such as roads and credit services. As a result, most of the traditional coping strategies employed by households such as changing cropping patterns/seasons, building houses on raised platforms and moving animals to higher grounds largely failed to effectively help households get by the impacts of flooding. Moreover, some of the coping strategies such as changing planting seasons and the associated expansion of farmlands in to the wet lands of Lake *Tanna* during the dry seasons as a way of compensating for the loss of production were found to adversely affect the natural resources of the area. Such strategies were found to potentially cause environmental degradation and are likely to threaten the livelihood security of households in the future.

The role played by social capital in helping households cope with the effects of flooding was found to be limited particularly in the face of severe floods that affect large number of people. As a result more and more households were forced to resort to the selling of assets such as oxen to cope with the shock in the absence of social supports and informal

transfers. Moreover, structural flood control mechanisms employed by the households such as dyke constructions were found to be less effective in terms of bringing about lasting solutions to the problem, which seem to increase from time to time. The lack of basic infrastructural and social services that limit income diversifying opportunities in the area, lack of coordination between government efforts in mitigating floods and local coping strategies, and the increasing severity and magnitude of flooding were found to be the major factors that limit the effectiveness and sustainability of the coping strategies employed by households in the study area.

6.2 Suggestions

In this study, it is argued that flooding has been showing an increase in its frequency and severity having major effects on the people's livelihoods. In view of this, the study suggests the following possible intervention measures aimed at improving the resilience and coping capacity of rural households faced by recurrent flood disasters.

- The increasing frequency and severity of flooding that affects the livelihoods of people in terms of their food security conditions, this calls for an adjustment of agricultural practices with a major focus on the supply of flood resistant crop varieties such as rice.
- There is a need for strengthening the resilience of households through the provision of improved access to infrastructural and social services such as all weather roads, credit and markets that help open gates of income diversifying opportunities in the area.
- Improved flood protection structures such as dykes, flood diversion structures and regular cleaning of river beds would help households to protect their assets during flooding.
- There is a need to develop an integrated watershed management plan in the *woreda* in order to conserve the natural resource base of the area especially to protect the bio diversity of Lake *Tanna*. Specifically, activities like soil conservation, afforestation and terracing should be given attention with the view of reducing environmental degradation.

- There is a need to integrate local level responses or coping strategies to flood disasters into flood disaster mitigation and response strategies. This is crucial since short term relief measures such as food/seed provision can not address the problem in sustainable manner.
- There is a need for further research in the area of flood disaster risk management and livelihood resilience in the *woreda*. Moreover, study should be conducted to look into how the disaster risk management system at national and regional levels is working towards responding to the problem.

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Annex I:**Damages of the 2006 and 2007 floods in the study *kebeles***

Year	<i>kebele</i>	Number of affected people	Damage on crops measured In hectare	Crop damage in Percent	Number of livestock affected
2007	Tana weina	1601	912.5 ha	---	Cattle(10),ruminants(35),pack animals(2) hens(350) & beehive(44)
	Gura amba Bata	842	852 ha	85%	9 cattle
2006	Tana weina	2769	1096.4 ha	69.8 %	Cattle(24),pack animals(4) hens(935) & beehive(13)
	Gura amba Bata	640	438.25 ha	70.1%	5 cattle

Source: *Dembia Woreda* Agriculture and Rural Development Office

Annex II:

Structured Questionnaire for Household Survey

A.1. Household profile

1.	Household identification number	
2.	Date of interview	
3.	Kebele name	1. _____ 2. _____
4.	Gott name	1. _____ 2. _____
5.	Name of household head	
6.	Sex of Household head	1. Male 2. Female
7.	Age(write age in completed years)	
8. Religion	1. Christian 2. Muslim 3. Other, specify	
9. Marital status	1. Single 2. Married 3. Divorced 4. Widowed 5. Separated	
10. Educational status attained	1. Can't read and write 2. read and write 3. primary education 4. Secodary education	
11. Is the head capable to work or economically active?	1. Yes 2. No	
12. Number of permanent household members at the time	Male _____ Female _____ Total _____	
14. How many of the household members are economically active?		

B.1. Household Livelihood activities, labor supply and income

15. In the last 12 months, which types of work or activities did the members of your household do, in order to earn food or income? Who worked at each activity?

Activity/income source	Who worked at each activity? (Mark as many as apply)				
	Household Head	Spouse	children	Other members of household	Hired labor
1. Agriculture					
Crop production					
Livestock rearing					
Cattle fattening					
Poultry rearing					
2. employment/labor					
Formal/salaried					
Local agricultural labor					
Migration for agricultural					

Labor					
Migration for non-agricultural Labor					
3.trade					
4.sale of natural products					
Honey sales					
Grass or fodder sales					
Eucalyptus sells					
5.crafts making					
Pottery					
Making cloths					
6.Rents					
Sharecropping out land					
Renting out land					
Renting out pack animals					
Renting out Oxen					
Other(write name of the activity)					

B.2. Income

16. What was the average household income earned per month from all the sources?

(Write number)

B.3. Household labor conditions

17. How do rate the supply of labor for engaging in livelihood activities of your household?

1. More than Adequate 2. Adequate 3. Not adequate

18. Did you or any member of your household ever been critically ill and unable to work for the past 3 months or more?

1.Yes	2.No
-------	------

C.1. Access to Natural Capital: Land

19. Do you or (any member of your household) own any land?

1.Yes	2.No
-------	------

(If no, skip this section and go to section C.2)

20. How many *timads* of farming land does your household own now? (Include fallow land)

(Write number)

C.2. Access to Farming land management

21. Did you (or any member of your household) farm during the last farming season?

1. Yes	2. No
--------	-------

22. If your answer for the previous question is 1, would you tell us how many *timads* of land your household cultivated during the last agricultural season? (Include sharecropped and rented land)

23. Please tell us about the land you used for farming, and land you rented out or sharecropped to others.

Ways of Access to Land	1. Yes	2. No
Farmed own land		
Sharecropped in land		
Rented in land		
Share cropped out land		
Rented out land		
Purchased land		

24. What has happened to the size of your landholding over the last ten years? 1. Increased 2. Decreased 3. No change

25. If the size of your landholding decreased, what do you think are the reasons for its decrease? _____

26. Would you tell us about the characteristics of your farm plots (relief Situation, soil type according to local naming and fertility status)?

Plot identification/number of plots	Soil	
	Type	Fertility status
	1. black 2. Red 3. Brown 4. Grey	1. Poor 2. Moderate 3. Fertile

27. What are the main constraints to your farmlands? Identify the four main constraints according to the degree of severity:

<i>Constraints</i>	<i>1. Yes</i>	<i>2. No</i>	<i>Rank order</i>
water logging			First
Erosion			Second
Poor soil fertility			Third

Sedimentation as a Result of floods		Fourth	
High Susceptibility to flooding			
Susceptibility to wild life attack			
Pests and weeds			
Land slide			

D.1. Household Livelihoods Buffer Capacity Situation (financial capital and physical capitals)

1. Livestock holding

28. Would you tell us the number of stock your household currently own?

<i>Type of Livestock</i>	<i>Number</i>
Chickens	
Sheep	
Goats	
Plough oxen	
Cows	
Bulls	
Calves	
Donkeys	
Horses	
Mules	
Others, specify	

D.2. Access to Cash credit: financial capital

29. In the last 12 months, has any member of your household borrowed any money?

1. Yes	2. No
--------	-------

D.4. Housing conditions: physical Capital

33. Observe the Housing conditions of the sample Household or ask the Household respondents about their housing and fill out the following table.

Roof	Material (circle one)		Condition (circle one)	
	Tin/ metal	1	Good/adequate condition	1
		Poor condition- inadequate protection from Flooding	2	
Thatch	2			
Other specify	3			
Walls	Stone	1	Good/adequate condition	1
	Earth and wood	2	Poor condition-inadequate protection from Flooding	2
	Other specify	3		

E.1. Social network and relations: Social Capital

34. In which of the following community based organizations do you participate?

Institution	Participated this year ? (circle one)		Participated In the past (circle one)	
	Yes	No	Yes	No
	1	2	1	2
Idir	1	2	1	2
Saving groups	1	2	1	2
Iquib				
Maheber/senbete	1	2	1	2
Reciprocal/exchange work	1	2	1	2

<i>Groups(e.g. wenfel)</i>		
<i>Festive work groups(debbo)</i>	<i>1 2</i>	<i>1 2</i>
<i>Others, specify</i>	<i>1 2</i>	<i>1 2</i>

E.2. Informal transfers

35. In the last 12 months, has your household received any of the following types of assistance from anyone outside the household?

<i>Item</i> <i>(circle code as many as apply)</i>		<i>From whom</i> <i>(circle as many as apply)</i>
<i>Cash gift</i>	<i>Yes No</i> <i>1 2</i>	<i>1 2 3 4 5</i>
<i>Cash loan(no interest)</i>	<i>1 2</i>	<i>1 2 3 4 5</i>
<i>Food or grain gift</i>	<i>1 2</i>	<i>1 2 3 4 5</i>
<i>Grain loan (no interest)</i>	<i>1 2</i>	<i>1 2 3 4 5</i>
<i>Seed loan</i>	<i>1 2</i>	<i>1 2 3 4 5</i>
<i>Free labor</i>	<i>1 2</i>	<i>1 2 3 4 5</i>
<i>Free use of oxen or plough</i>	<i>1 2</i>	<i>1 2 3 4 5</i>
<i>free use of donkey/mule/horse</i>	<i>1 2</i>	<i>1 2 3 4 5</i>
<i>Other</i>	<i>1 2</i>	<i>1 2 3 4 5</i>
		<u><i>Codes: from Whom</i></u> <i>1=relative in the same rural keble</i> <i>2=relative in other rural keble</i> <i>3=relative in urban areas</i> <i>4= friend /neighbor</i> <i>5= others</i>

36. Has your household been receiving remittances?

1. Yes	2. No
--------	-------

F.1. effect of flooding on Livelihood of the household

37. Have you been affected by flooding in the last 12 months?

1. Yes	2. No
--------	-------

38. If yes, please tell us how you were affected by the flooding. (Circle as apply)

Effects of flooding	1. Yes	2. No
Suffered death of a Household member	1	2
Lost crops on farm	1	2
Lost crops in stock	1	2
Exposed to food insecurity	1	2
Lost grazing land	1	2
Lost farm land	1	2
Lost livestock	1	2
Damage to house	1	2
Exposed to diseases Such as AWD, malaria	1	2
Dislocated and forced Live in temporary shelters	1	2
Lost household property And saving	1	2
Loss of services Such as roads, schools, health posts, Water wells etc...	1	2
Other, specify	1	2

G.1. Household Coping Strategies

39. How do you cope with the problem of flooding both at household and community levels?

Type of coping strategy	1. Yes 2.No (Circle one)	when do you use the strategy (Circle as many as apply) 1.before flooding 2.during the floods 3.after the flooding
Relocate dwelling	1 2	1 2 3
Change cropping pattern	1 2	1 2 3
Maintain/construct local Flood control structures such As dykes	1 2	1 2 3
Engage in local water shed Management practices	1 2	1 2 3
Borrow food or cash	1 2	1 2 3
Borrow seeds	1 2	1 2 3
Specialize on livelihood activities Such as planting adaptive crops such As rice	1 2	1 2 3
Sell assets to buy food e.g. Sell of farm oxen	1 2	1 2 3
Diversify livelihood activities off-farm and on farm such as Migrate to urban areas to find work, Rent out animals, Firewood and charcoal selling, wage labor on others farms,etc...	1 2	1 2 3
Rely on informal social transfers eg. Rely on help form relatives and friends	1 2	1 2 3
Relying on formal transfers or public relief Assistances from government and NGOs eg. Rely on relief grains	1 2	1 2 3

G.2. constraints to coping strategies

40. How do you rate the effectiveness of the coping strategies that you have employed during last seasons floods? 1. Effective 2. Not effective

Advices on better flood management Practices	1	2
Other, specify		

H.2. Self –assessment of Household situation/ well-being

45. How would you describe the current situation of your household's livelihood as compared to previous years?

<i>Categories</i>	Now	The same year Last year (1999 E.C) (Circle one)	The same time 2years ago (1998 E.C) (Circle one)	10 years Ago (1990E.C) (Circle one)
Doing well(Sustainable and more resilient to the effects of shocks) able to meet household needs by your own efforts, and making some extra for stores, savings and investments(e.g. buying livestock or other assets, improving farmland, improving housing etc)	1	1	1	1
Doing just ok(viable or less sensitive to the effects of shocks) able to meet household needs but with nothing extra to save or invest	2	2	2	2
Struggling(vulnerable) managing to meet household needs, but by depleting productive assets and/ or sometimes receiving support from community or government	3	3	3	3
Unable to meet Household needs(destitute and highly sensitive to the effects of shocks and less resilient) dependent on support from community or government	4	4	4	4

Annex III:

Focus Group Discussion guide

Discussion Topics	Key issues to be discussed	Guiding Questions
<p>1. flooding as a livelihood shock/ Problem</p>	<p>A. examine the effects of floods in the wereda</p> <p>B. assess the frequency and severity of the problem in the most recent five years</p> <p>C. Discuss HH and community vulnerability, the problem of people being exposed to the effects/risks of flooding</p> <p>D. Examine what livelihood stress or shocks have flooding impacted households in the area. Look at these from different perspectives: historical presently active, rare, seasonal, etc</p>	<p>-what types of hardships have your community faced over the past five years or recent past</p> <p>-How does flooding have affected the daily living livelihoods of families in your communities how?</p> <p>-How often does flooding happen in the area?</p> <p>-How long do the floods last in the affected area?</p> <p>-How severe the effects have become?</p> <p>-Who is affected by these hardships (e.g. everyone similarly affected, or some more than others?), How? And why?</p> <p>-How often do these happen? How long have they lasted?</p>
<p>2. Livelihood</p>	<p>a) Access to Livelihood assets/resources</p>	
	<p>Natural resource base</p>	<p>How your community getting access to farmland, and grazing land?</p>
	<p>Financial capital</p>	<p>What are main sources of cash in the community? (probe for examples of livestock, cash crops, field crops, etc,)</p>
	<p>Physical capital</p>	<p>What are main sources of cash in the community? (probe for examples of livestock, cash crops, field crops, etc,)</p>
	<p>Social capital</p>	<ul style="list-style-type: none"> • What informal institutions (CBOs, <i>equib</i>, <i>idir</i>, labor organization, etc) in which community members participate

		<p>in the area? How?</p> <ul style="list-style-type: none"> • What support/assistance that your community usually transfer for those households, who had a problem of food, cash, farm oxen, seed, and sick persons, labor for sick and old aged people, and those affected by floods etc? How? (Probe for examples freely, loan, gift, reciprocity (exchange), etc.). Probe again for their relation with the households.
	<p>b) Livelihood strategies</p>	<p>What livelihood strategies that your community practices in order to live? Give examples.</p> <p>- What farm management practices that your community has experienced to reduce the damage of flooding on the farm lands ? Give examples</p>
<p>3. Resilience and vulnerability</p>	<p>a) Resilience versus Vulnerability</p> <ul style="list-style-type: none"> • Participants' perceptions of these concepts 	<ul style="list-style-type: none"> ▪ What does having “livelihood resilience” means to you? And/or what does a family that is “livelihood resilient” look like in your communities? And/or describe the characteristics of livelihood resilience households. Identify the local characteristics of resilience. ▪ What are the factors that determine the resilience of the people in the face of flood disasters ▪ What does having “vulnerability” mean to you and/or what does a family that is “vulnerable” looks like in your communities? And/or describe the characteristics of “vulnerable” households.

<p>4. Coping strategies</p>	<p>a) Investigate short-term and/or seasonal coping mechanisms that communities/ household's use in the area. Example, how people cope with the "effects of flooding on their livelihoods such as loss of crop, farm land, loss of livestock major family illness, loss of employment, food shortage etc.</p>	<ul style="list-style-type: none"> ▪ During times of flooding ... how do families cope?
	<p>b) Investigate long-term coping mechanisms that the community or households use in the area: do they construct or maintain dykes, have they changed there cropping pattern and types of crops?</p>	<ul style="list-style-type: none"> ▪ Did you or any members of your community ever do any livelihood activity in the past that you or and/or they do not any more now? ▪ What was/were the livelihood activity /ies? <p>Why did you or your community stop doing it (them)?</p>

Annex IV:

1. In-depth interview guide used in the study

1. Household profile in terms of Demographic characteristics:

Name, age, sex

Family size by sex

Household labor supply

Literacy status of members (human capital)

Mortality history

Health problems in the household

2. The effects of floods on the livelihood of the household

Damage to human capital (loss of life, unemployment, Injury)

Loss of crops, type and amount

Loss of farm land

Loss of pasture land, amount

Loss of or damage on housing

Incidence of waterborne and vector borne diseases such as AWD, Typhoid and Malaria

In the household

Dislocation of the household

Loss of property

Degree of perception of flooding as a livelihood threat

3. Access to natural capital

Land holding size

Ways of getting access to land

Change in the size of holding over the last few years

Main problems of farmland

Land management practises

Perception towards the recurrent floods in the area

4 Financial capital and physical capital

What is the average earnings of the household from different sources in kind and in cash(e.g. . x quintals of grain, x birr per month etc)

What other sources of finance are there e.g. credit(formal and informal), government or NGO support etc

Trends in production of crops (increase/decrease/ unchanged-why)

Non-farm activities that the head and other members undertake

Income from non-farm activities and purposes for which it was used (e.g. for reconstructing housing, for buying livestock lost due to flooding, etc)

Credit availability and source

Housing situation

Possessions of farm equipment and other assets

5. Social capital

Participation in informal institutions (e. g. CBOs such as *iddir*, *equib*, *maheber*, *senbete* etc...)

Participation in labor exchange /sharing organizations (e. g. *Debo* or *wenfel* in house construction,)

Support in cash and in kind received from neighbours and relatives at times of crisis such as flooding or the amount of informal transfers received.

Remittances received from relatives or friends

6. Availability and access to rural infrastructure

Health care services

Schooling

Potable water sources

Agricultural extension services

Veterinary services

7. Degree of dependence on external institutions

Have you ever been recipient of relief grain or any other aid due to flooding? For how many years?

The amount of formal transfers received in the last 12 months from government and aid organizations

8. Major livelihood activities

-What are the different activities that households in the community use to support their

livelihoods .Identify the types livelihood activities

-Identify the combinations of livelihood activities and their contribution to the income or consumption of households

9. Coping strategies in response to the effects of flooding.

-The types and sequences of coping strategies

-The effectiveness of the strategies

-The reasons for their ineffectiveness

-Factors that constrain the use of the coping strategies

10. Self assessment of the household well-being condition and resilience in the face of floods as natural disasters in the area

How do you rate the well-being conditions of your household as compared to others in your village?

How do you perceive resilience in the face of flooding as a livelihood shock? What kinds of Households are considered resilient in your community? I.e what are the criteria to be considered resilient?

How resilient is your household to the ill-effects of flooding.

What are the factors that determine your capacity to withstand and recover from the effects of flooding ?

Do you consider your household to be less resilient to the effects of flooding compared to others? Why?

Annex V:

Semi structured key-informant interview checklist with *Dembia Woreda* Agriculture Rural Development Officials

I. Physical Environment

1. Area of the *Woreda* in ha or km².
2. Agro-climate
3. Relief patterns
4. Land use (type and distribution)
5. Vegetation cover; type, density, etc (the situation in the last few years)
6. Soils: types, distribution, degradation (through erosion, etc)
7. Rainfall: (amount, distribution and variability)
8. Number of rural *kebeles* and urban *kebeles*

II. People and Sources of Livelihoods

1. Population size, and its trend for the last few years
2. Main field crops and perennial crops: cultivated lands, production time series data
3. Constraint to production risks of failure

IV. Flooding and Livelihood Resilience

1. Would you tell me briefly about the nature of flooding in the wereda, in terms of its Coverage/extent, seasonality, frequency and duration
(*Probe, would you please tell more about the following issues*)
 1. The area of land usually covered or flooded in the wereda as measured in terms of hectare or other local units of measurements,
 2. Could you identify the flood seasons,
 3. How often do major floods occur in the wereda?
 4. How long do the floods stay on farm, pasture and settlement lands)
 5. How severe is the effects they inflict on the people and their livelihoods.
2. How does flooding affect the livelihoods of people in the wereda?
3. What types of households are most vulnerable to flooding?
4. What are the people's main coping mechanisms? Which of these mechanisms seem sustainable?

5. For what supports communities most depend on your office?
6. How do you assess the Contribution of the office in terms of promoting the resilience of rural households towards flood disasters in the area? (In other words, do you have any programs or projects that deal with increasing the capacity of households to better withstand the effects of flooding or do you focus on the provision of relief assistances to victims)
7. Is there any NGOs intervention in the area with regards to promoting resilience of rural households in the face of flood disasters?

Appendix VI: List of Key informants

No.	Full Name	Sex	Position
1	Abebe Mamo	Male	Animal husbandry and forage development expert
2	Aklilu Diro	Male	Woreda land use expert
3	Alemayheu Asrat	Male	Agronomist
4	Alemu Miteku	Male	Animal health technician
5	Ayalew Kende	Male	Development Agent
6	Bayelegen Matrew	Male	Development Agent
7	Dejene Ketema	Male	Head of Dembia Woreda Agriculture and Rural Development Office
8	Desalegen Jember	Male	Extension team leader
9	Kifle Ayelegen	Male	Rural roads technician
10	Tekelehymanot Desta	Male	Soil and water conservation expert
11	Reda Abreha	Male	Pest control technician
12	Mola Zeleke	Male	Farmer, Tanna Weina kebele
13	Gezachew Addis	Male	Farmer ,Tanna Weina kebele
14	Abebe Telaye	Male	Farmer, Gura amba kebele
15	Yeferuit Moges	Male	Farmer, Tanna Weina kebele
16	Ayelegen Derebew	Male	Farmer ,Gura amba kebele

ANNEX VII: pictures from the field



Flood dykes on the river *Megech*



Data collection at the field



Gullies created by flooding



grazing lands covered by weeds

Declaration

I, the undersigned, declare that the thesis is my original work, has not been presented for a degree in any other university and that all sources of material used for the thesis have been duly acknowledged.

Declared by:

Zerikun Berhane
Zerikun B

Candidate

Confirmed by:

Yizremew Adal
Yizremew A

Advisor